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EDITORIAL.

Experiments with Derris

The experiments described in this number are concerned with the propagation of individual clones of high-quality derris with a view to the study of variations in yield, rotenone content and ether extract of the progeny of these clones.

The subject of these investigations is of utmost importance to cultivators for there has always been uncertainty as to the best planting distance, and of the age at which the plants should be harvested. Furthermore, knowledge has been incomplete as to the selection of planting material. The aim of the cultivator must always be to produce the largest crop possible in the shortest time without prejudice to the quality of the product as marketed. On these aspects of the subject the authors now throw light and their summary and conclusions, which will be found at the end of the article, will provide a guide for those who contemplate the cultivation of this crop. In view of the conciseness of the summary we do not propose to restate their conclusions in this place, but desire to emphasize the practical value of this investigation.

The elucidation of problems such as are here discussed almost invariably presents new problems so that finality is never reached. Each step taken, however, is a step in advance, and may be considered of practical and permanent value. Thus in the present case, although the most economic spacing of plants is not determined, it is shown that wider spacing than is normally the practice produces no increased crop and a product in no way superior in quality to that obtained from closer planting. Similarly, although wide variations are found in the ether extract and rotenone content of individual plants from the same clone, yet the fact is established that the average toxic content of a mixed population remains of the same order from generation to generation.

The present market for derris is a small one, but it shows a marked tendency to improve. We believe that it has a future, and in order that the Malayan product may be firmly established, it is essential that the quality of the product be satisfactory. In the furtherance of this object the results of the investigations of the Department will form the sure basis.

Estate Labourers as Stockowners.

In the November 1938 issue of this Journal we published an article on The Settlement of Tamil Labourers on the Land, and in our editorial comments thereon advanced the view that success in this direction depended on the sympathetic guidance and encouragement of the manager and his senior staff. It was emphasized that the encouragement should not necessarily be by the provision of funds or capital for it is necessary to encourage the labourers to seek salvation by their own efforts rather than for them to expect the controlling hand to smooth out all difficulties.

In the present issue we publish an article on Livestock on Estates, a straightforward personal account by a manager of a rubber estate of the guidance and encouragement which he has given his labour force on the keeping of livestock on the estate.

One is struck by the simplicity of the scheme which Mr. Walker has encouraged and which has proved so successful. Its simplicity made it easily understood and appreciated by the labourers, while its connexion with the Estate Labourers' Co-operative Society in the provision of capital for the purchase of animals lends the scheme dignity and adds to the usefulness of the Society.

From time to time over a number of years we have advocated the encouragement of any considered scheme which will increase the food supply in Malaya. Never has local food production been of more importance than at the present time, and for this reason as well as that of the desirability of maintaining a settled and contented labour force, we commend the scheme which our contributor has advanced.

FURTHER EXPERIMENTS WITH SELECTED PLANTS OF *DERRIS ELLIPTICA*, CHANGI No. 3

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Introductory.

An account was given in a previous number of this Journal of selection experiments carried out both at Serdang and Kuala Lumpur with plants of *Derris elliptica,* Changi No. 3, the roots of which are characterized both by a high rotenone content and high ether extract.(1)

Following on those experiments, cuttings from certain outstanding plants were kept separate and propagated as individual clones with a view to studying intra- and inter-clonal variations. The factors underlying selection of these special plants were: (a) yield of root, (b) rotenone content, and (c) ether extract.

Yield of root is stressed since, if this character is found to be hereditary, a marked development in this respect can far outweigh a slightly lower toxic content, whether of rotenone or ether extract. Judged from the standpoint of a producer the ultimate criterion within a race of Derris must remain return of toxic content per acre as determined by the product, yield of root x toxic content.

Eighteen plants were selected at Serdang and seven at Kuala Lumpur.

With such a relatively small number of plants involved, sufficient space for the vegetative progeny was again available in the General Nurseries at Serdang and Kuala Lumpur.

Lay-out of Experiment.

The rooted cuttings at Serdang were set in rows 4 ft. apart with 6 ft. between the plants in the rows. Eleven plants formed one row, the number of rows being dependent on the number of rooted cuttings available from one parent plant.

The individual plants in a vegetative progeny were, therefore, allowed much more space for development than the parent plant, 24 sq. ft. compared with about 9 sq. ft.

At Kuala Lumpur the rooted cuttings were planted in double rows in narrow beds; the rows were 3 ft. apart with the same distance between the individual plants in a row. In this case the planting distance for the vegetative progeny was approximately the same as for the parent plant.

In both cases the rooted cuttings were planted in November, 1936.

There were few casualties and the plants soon became established, gradually covering the ground.

Results of Analysis.

The results of analysis will be considered under the following headings: (a) yield of root, (b) ether extract of root, (c) rotenone content of root, and (d) correlation between rotenone and ether extract.

(a) Yield of Root.

Marked differences were found between the weights of air-dry (moisture content 8 per cent.) marketable root from individual members of a vegetative progeny from a single parent plant. These differences apply equally at all the ages at which the plants were examined, also to both planting distances.

Table I shows the results obtained at Serdang with three series of plants, one harvested at 18 months and two at 25 months. The latter is approximately the same age at which the corresponding parent plants were lifted.

The above figures show that in the case of the vegetative progeny of parent plant No. 14 the weight of root at 15 months varied from 16.44 to 3.74 ozs. with an average of 8.51 ozs. With a vegetative progeny harvested at 25 months, when it is approximately the same age as that at which the parent plants had been harvested, the weight of root for that of parent plant No. 51 varied from 28.30 to 4.30 ozs., with an average of 14.77 ozs., while for that of parent plant No. 73 the range was from 36.11 to 9.21 ozs., with an average of 19.53 ozs.

Comparing the two vegetative progeny harvested at approximately the same age as the parent plants it is interesting to note that while in the case of No. 73 the average figure for the vegetative progeny represents a three-fold increase compared with that of the parent plant, the figures for parent plant No. 51 and its vegetative progeny are of the same order. The latter figures are somewhat unexpected in view of the wider spacing for the vegetative progeny compared with the parent plants, 24 sq. ft. compared with 9 sq. ft. per plant. Further reference will be made to this point.

Table II shows the results obtained at Kuala Lumpur with three series of plants, one harvested at 18 months, one at 21 months and one at 24 months. The last is approximately the same age at which the corresponding parent plants were lifted.

The above figures show that in the case of the vegetative progeny of parent plant No. 7 the weight of root at 15 months varied from 5.12 to 1.45 ozs., with an average of 2.47 ozs., and for the vegetative progeny of parent plant No. 2 the weight of root at 21 months varied from 3.18 to 0.97 ozs., with an average of 1.99 ozs. For the vegetative progeny of parent plant No. 3 the weight of root at 24 months, which is approximately the same age as that at which the parent plant had been harvested, varied from 5.40 to 1.41 ozs., with an average of 3.44 ozs.

A comparison of the average figures with those for the respective parent plants shows that for the vegetative progeny at 15 and 18 months the weights of root are of the same order. In the case of the vegetative progeny at 24 months, which is approximately the same age at which the parent plant was harvested, the average weight of root per plant based on 10 plants is less than that from the parent plant.

Table I.

Comparative Yields of Air-Dry Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, at Serdang, Spaced 6 ft. x 4 ft.

Serial No. of Vegetative Progeny	Age of Plants	Weight of Root
	months	ozs.
Parent Plant No. 14, 23 to 24 months old, 11.45 ozs.		
1 ...		10.62
2 ...		10.19
3 ...		5.47
4 ...		11.89
5 ...	18	7.02
6 ...		7.02
7 ...		16.44
8 ...		8.88
9 ...		3.74
10 ...		3.80
	Maximum ...	16.44
	Minimum ...	3.74
	Average ...	8.51
Parent Plant No. 51, 23 to 24 months old, 13.40 ozs		
1 ...		9.85
2 ...		8.66
3 ...		4.76
4 ...		17.39
5 ...	25	17.37
6 ...		26.79
7 ...		14.75
8 ...		15.56
9 ...		28.30
10 ...		4.30
	Maximum ...	28.30
	Minimum ...	4.30
	Average ...	14.77
Parent Plant No. 73, 23 to 24 months old, 6.15 ozs.		
1 ...		14.58
2 ...		15.94
3 ...		12.23
4 ...		18.06
5 ...	25	27.88
6 ...		36.11
7 ...		25.64
8 ...		11.20
9 ...		9.21
10 ...		24.42
	Maximum ...	36.11
	Minimum ...	9.21
	Average ...	19.53

Table II.

Comparative Yields of Air-Dry Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, at Kuala Lumpur, Spaced 3 ft. x 3 ft.

Serial No. of Vegetative Progeny	Age of Plants	Weight of Root
	months	ozs.
Parent Plant No. 7, 23 months old, 2.20 ozs.		
1 ...		2.15
2 ...		2.54
3 ...		2.61
4 ...		2.36
5 ...	18	3.00
6 ...		5.12
7 ...		1.83
8 ...		1.73
9 ...		1.45
10 ...		1.94
Maximum ...		5.12
Minimum ...		1.45
Average ...		2.47
Parent Plant No. 2, 24 months old, 2.45 ozs.		
1 ...		2.16
2 ...		1.50
3 ...		2.45
4 ...		1.94
5 ...	21	3.18
6 ...		1.41
7 ...		1.94
8 ...		1.98
9 ...		2.41
10 ...		0.97
Maximum ...		3.18
Minimum ...		0.97
Average ...		1.99
Parent Plant No. 3, 23 months old, 5.45 ozs.		
1 ...		4.48
2 ...		2.12
3 ...		4.06
4 ...		3.81
5 ...	24	1.94
6 ...		1.41
7 ...		2.82
8 ...		3.17
9 ...		5.22
10 ...		5.40
Maximum ...		5.40
Minimum ...		1.41
Average ...		3.44

Table III.

Average Weight of Air-dry Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Serdang, Spaced 6 ft. x 4 ft.

Reference No. of Plant	Details of Plants	No. of Plants Harvested	Age of Plants	Weight of Root
			months	ozs.
2	*Parent plant* ...	*1*	*23—24*	*12.20*
	Vegetative progeny ...	10	23	5.99
	do. do. ...	10	30	7.05
4	*Parent plant* ...	*1*	*23—24*	*5.25*
	Vegetative progeny ...	10	21	8.71
9	*Parent plant* ...	*1*	*23—24*	*5.65*
	Vegetative progeny ...	10	15	7.90
	do. do. ...	10	18	7.54
	do. do. ...	10	21	8.80
	do. do. ...	10	26	9.43
	do. do. ...	10	30	10.18
10	*Parent plant* ...	*1*	*23—24*	*4.25*
	Vegetative progeny ...	10	23	12.66
	do. do. ...	10	30	10.18
12	*Parent plant* ...	*1*	*23—24*	*2.09*
	Vegetative progeny ...	7	23	14.58
14	*Parent plant* ...	*1*	*23—24*	*11.45*
	Vegetative progeny ...	10	15	6.70
	do. do. ...	10	18	8.51
	do. do. ...	10	21	8.53
	do. do. ...	10	26	13.76
	do. do. ...	10	30	12.38
20	*Parent plant* ...	*1*	*23—24*	*5.50*
	Vegetative progeny ...	10	23	10.05
31	*Parent plant* ...	*1*	*23—24*	*8.80*
	Vegetative progeny ...	10	23	8.12
39	*Parent plant* ...	*1*	*23—24*	*10.40*
	Vegetative progeny ...	10	25	13.95
51	*Parent plant* ...	*1*	*23—24*	*13.40*
	Vegetative progeny ...	10	25	14.77
52	*Parent plant* ...	*1*	*23—24*	*8.10*
	Vegetative progeny ...	10	25	11.87
71	*Parent plant* ...	*1*	*23—24*	*7.40*
	Vegetative progeny ...	10	25	15.63
73	*Parent plant* ...	*1*	*23—24*	*6.15*
	Vegetative progeny ...	10	25	19.53
74	*Parent plant* ...	*1*	*23—24*	*9.15*
	Vegetative progeny ...	10	25	13.81
76	*Parent plant* ...	*1*	*23—24*	*2.00*
	Vegetative progeny ...	10	23	7.62
77	*Parent plant* ...	*1*	*23—24*	*6.15*
	Vegetative progeny ...	10	25	13.44
79	*Parent plant* ...	*1*	*23—24*	*2.10*
	Vegetative progeny ...	10	23	8.13
104	*Parent plant* ...	*1*	*?*	*14.65*
	Vegetative progeny ...	7	25	6.16

In Tables III and IV the figures for the average weight of air-dry marketable root per plant at various ages both from the Serdang and Kuala Lumpur stocks have been summarized.

In the case of the Serdang plants, in which the vegetative progeny were planted at a wider interval than the parent plants, the results tend to confirm the view expressed above that with this race of Derris a wider spacing is not necessarily reflected in a corresponding increase in the average weight of root per plant to be

Table IV.

Average Weight of Air-dry Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Kuala Lumpur, Spaced 3 ft. x 3 ft.

Reference No. of Plants	Details of Plants	No. of Plants Harvested	Age of Plant	Weight of Root
			months	ozs.
1	*Parent plant* ...	*1*	*23*	*0.90*
	Vegetative progeny ...	10	24	2.17
2	*Parent plant* ...	*1*	*23*	*2.45*
	Vegetative progeny ...	10	15	1.44
	do. do. ...	10	18	3.28
	do. do. ...	10	21	1.99
	do. do. ...	10	30	4.92
3	*Parent plant* ...	*1*	*23*	*5.45*
	Vegetative progeny ...	10	12	1.19
	do. do. ...	10	24	3.44
5	*Parent plant* ...	*1*	*23*	*4.00*
	Vegetative progeny ...	10	24	2.77
6	*Parent plant* ...	*1*	*23*	*3.40*
	Vegetative progeny ...	10	24	2.68
7	*Parent plant* ...	*1*	*23*	*2.20*
	Vegetative progeny ...	10	15	2.48
	do. do. ...	10	18	2.47
	do. do. ...	10	21	1.98
	do. do. ...	10	30	3.97
8	*Parent plant* ...	*1*	*23*	*4.00*
	Vegetative progeny ...	10	12	1.78
	do. do. ...	10	24	3.20

anticipated from the increased space allowed for individual development. Unlike *D. elliptica*, Sarawak creeping, which responded so markedly to a wider spacing, *D. elliptica*, Changi No. 3, may not be characterized by a marked root development(2). Only spacing experiments planned according to the principles of field experimentation can decide this point and such experiments have been laid down at Serdang.

As might be expected, the results for the Kuala Lumpur plants show that with the same spacing the average weights of root per plant for the parent plants and the vegetative progeny are of the same order.

(b) Ether Extract of Root.

As with the other two species of Derris described in a previous article the results again indicate that while ether extract has developed in the root at a comparatively early age there may be a wide difference between the figures for a parent plant and any member of its vegetative progeny, also between any two members of the progeny(2).

Tables V and VI illustrate the range of variation found with plants of different ages at Serdang and Kuala Lumpur respectively. Thus, in the case of plants aged 25 months at Serdang there is a difference of over 5 per cent. between the ether extract for parent plant No. 74 and one member of the vegetative progeny, No. 1, while there is a similar range of variation between the maximum and minimum figures of the vegetative progeny, Nos. 2 and 1 respectively.

In the case of Kuala Lumpur plants the variations are possibly still more marked. Thus, with plants aged 21 months there is a difference of more than 10 per cent. between the ether extract for parent plant No. 7 and vegetative progeny No. 2, while there is a difference of nearly 14 per cent. between the maximum and minimum figures of the vegetative progeny Nos. 4 and 2 respectively.

In this connexion it may be mentioned that recent work with plants of *D. elliptica*, Sarawak creeping, has shown that a low ether extract figure for one member of a vegetative progeny is not necessarily perpetuated, provided the plant is derived from a strain characterized by a high ether extract. The following example may be quoted.

The figure for the ether extract of the roots of a plant was found to be approximately 25 per cent., calculated on a moisture free-basis. Among the members of the vegetative progeny was one in which at 17 months the ether extract calculated on the same basis, was approximately only 17.9 per cent. Cuttings from this plant were established in the General Nursery at Serdang and the average ether extract figures, based on five members of the vegetative progeny when 18 and 24 months old, were approximately 27.2 and 25.6 per cent. respectively, calculated on a moisture-free basis.

Reference to Tables VII and VIII shows that in the majority of cases the average figure for any vegetative progeny is slightly lower than that for the corresponding parent plant at the same age.

Table V.

Variation in Ether Extract of Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Serdang.

(Moisture-free basis)

Serial No. of Vegetative Progeny	Age of Plants.	Ether Extract	
		Parent Plant No. 9, 23 to 24 months old, 29.60 per cent.	*Parent Plant No. 14, 23 to 24 months old, 28.50 per cent.*
	months	per cent.	per cent.
1 ...		29.80	28.04
2 ...		28.82	29.17
3 ...		27.42	26.07
4 ...		29.97	27.75
5 ...	18	26.40	31.17
6 ...		26.51	29.08
7 ...		28.18	28.77
8 ...		27.23	28.95
9 ...		26.99	26.16
10 ...		28.55	24.74
Maximum ...		29.97	31.17
Minimum ...		26.40	24.74
Average ...		27.99	27.99
		Parent Plant No. 73, 23 to 24 months old, 31.30 per cent.	*Parent Plant No. 74, 23 to 24 months old, 29.00 per cent.*
1 ...		27.61	23.99
2 ...		27.55	29.33
3 ...		28.44	25.22
4 ...		27.62	26.30
5 ...	25	25.92	26.80
6 ...		26.66	27.46
7 ...		27.27	26.25
8 ...		25.61	28.07
9 ...		26.33	27.38
10 ...		25.82	27.33
Maximum		28.44	29.33
Minimum		25.61	23.99
Average ...		26.88	26.81
		Parent Plant No. 2, 23 to 24 months old, 28.10 per cent.	*Parent Plant No. 10, 23 to 24 months old, 30.00 per cent.*
1 ...		28.96	25.43
2 ...		29.80	25.91
3 ...		30.39	24.42
4 ...		31.05	25.97
5 ...	30	29.47	23.59
6 ...		24.71	26.41
7 ...		25.82	22.90
8 ...		24.66	26.90
9 ...		22.39	25.12
10 ...		23.96	24.69
Maximum		31.05	26.90
Minimum		22.39	22.90
Average		27.12	25.13

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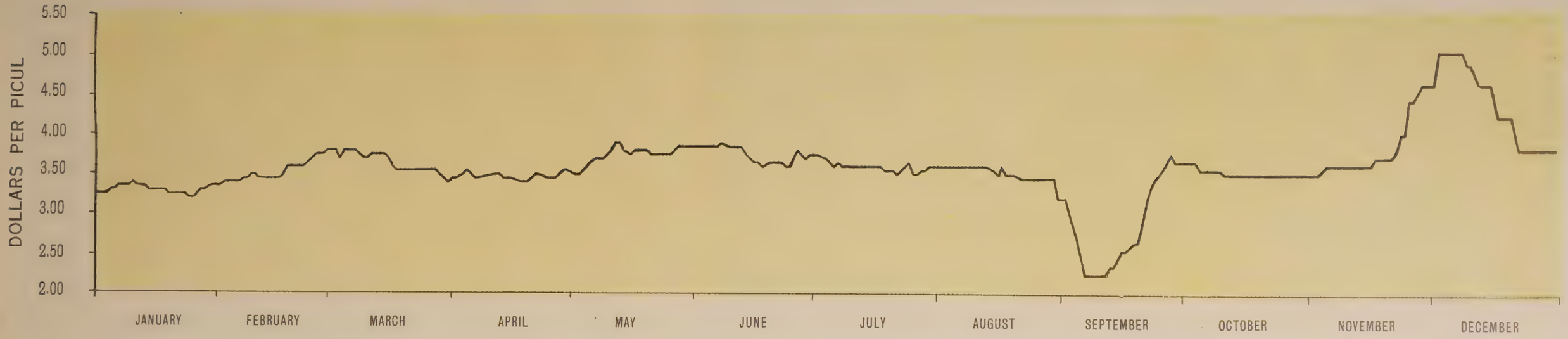

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Table VI.

Variation in Ether Extract of Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Kuala Lumpur.

Serial No. of Vegetative Progeny	Age of Plants.	Ether Extract	
		Parent Plant No. 3, 23 months old, 25.35 per cent.	*Parent Plant No. 8, 23 months old, 26.10 per cent.*
	months	per cent.	per cent.
1 ...		22.18	23.52
2 ...		23.57	23.05
3 ...		20.49	25.42
4 ...		22.46	26.29
5 ...	12	20.43	25.60
6 ...		21.24	27.05
7 ...		21.36	24.08
8 ...		26.77	24.07
9 ...		24.65	20.65
10 ...		18.79	18.77
Maximum ...		26.77	27.05
Minimum ...		18.79	18.77
Average ...		22.19	23.85
		Parent Plant No. 2, 23 months old, 24.75 per cent.	*Parent Plant No. 7, 23 months old, 24.20 per cent.*
1 ...		24.62	26.34
2 ...		26.20	13.86
3 ...		26.29	19.14
4 ...		24.30	27.67
5 ...	21	25.25	26.69
6 ...		26.20	25.02
7 ...		24.83	26.07
8 ...		24.81	26.26
9 ...		24.13	26.95
10 ...		23.75	24.85
Maximum ...		26.29	27.67
Minimum ...		23.75	13.86
Average ...		25.04	24.29
1 ...		24.23	21.31
2 ...		23.04	25.79
3 ...		23.48	26.56
4 ...		25.54	21.70
5 ...	30	22.40	26.04
6 ...		20.16	24.53
7 ...		22.02	16.96
8 ...		23.35	24.57
9 ...		22.75	26.11
10 ...		19.03	22.84
Maximum ...		25.54	26.56
Minimum ...		19.03	16.96
Average ...		22.60	23.64

Table VII.

Average Ether Extract of Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Serdang.

(Moisture-free basis)

Reference No. of Plant	Details of Plants	No. of Plants Harvested	Age of Plants	Ether Extract
			months	per cent.
2	*Parent plant* ...	*1*	*23—24*	*28.10*
	Vegetative progeny ...	10	23	25.93
	do. do. ...	10	30	27.12
4	*Parent plant* ...	*1*	*23—24*	*28.55*
	Vegetative progeny ...	10	21	27.68
9	*Parent plant* ...	*1*	*23—24*	*29.60*
	Vegetative progeny ...	10	15	28.94
	do. do. ...	10	18	27.99
	do. do. ...	10	21	29.31
	do. do. ...	10	26	26.66
	do. do. ...	10	30	26.92
10	*Parent plant* ...	*1*	*23—24*	*30.00*
	Vegetative progeny ...	10	23	24.47
	do. do. ...	10	30	25.13
12	*Parent plant* ...	*1*	*23—24*	*29.15*
	Vegetative progeny ...	7	23	28.42
14	*Parent plant* ...	*1*	*23—24*	*28.50*
	Vegetative progeny ...	10	15	29.99
	do. do. ...	10	18	27.99
	do. do. ...	10	21	28.70
	do. do. ...	10	26	26.76
	do. do. ...	10	30	27.20
20	*Parent plant* ...	*1*	*23—24*	*29.85*
	Vegetative progeny ...	10	23	26.77
31	*Parent plant* ...	*1*	*23—24*	*28.45*
	Vegetative progeny ...	10	23	26.63
39	*Parent plant* ...	*1*	*23—24*	*27.35*
	Vegetative progeny ...	10	25	25.99
51	*Parent plant* ...	*1*	*23—24*	*27.60*
	Vegetative progeny ...	10	25	25.51
52	*Parent plant* ...	*1*	*23—24*	*29.25*
	Vegetative progeny ...	10	25	23.16
71	*Parent plant* ...	*1*	*23—24*	*28.80*
	Vegetative progeny ...	10	25	23.96
73	*Parent plant* ...	*1*	*23—24*	*31.30*
	Vegetative progeny ...	10	25	26.88
74	*Parent plant* ...	*1*	*23—24*	*29.00*
	Vegetative progeny ...	10	25	26.81
76	*Parent plant* ...	*1*	*23—24*	*27.85*
	Vegetative progeny ...	10	23	25.87
77	*Parent plant* ...	*1*	*23—24*	*27.50*
	Vegetative progeny ...	10	25	26.49
79	*Parent plant* ...	*1*	*23—24*	*29.70*
	Vegetative progeny ...	10	23	26.32
104	*Parent plant* ...	*1*	*?*	*31.20*
	Vegetative progeny ...	7	25	26.17

Table VIII.

Average Ether Extract of Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Kuala Lumpur.

(Moisture-free basis)

Reference No. of Plant	Details of Plants	No. of Plants Harvested	Age of Plants	Ether Extract
			months	per cent.
1	*Parent plant* ...	*1*	*23*	*24.45*
	Vegetative progeny ...	10	24	23.06
2	*Parent plant* ...	*1*	*23*	*24.75*
	Vegetative progeny ...	10	15	25.54
	do. do_2 ...	10	18	25.18
	do. do. ...	10	21	25.04
	do. do. ...	10	30	22.60
3	*Parent plant* ...	*1*	*23*	*25.35*
	Vegetative progeny ...	10	12	22.19
	do. do. ...	10	24	23.33
5	*Parent plant* ...	*1*	*23*	*25.10*
	Vegetative progeny ...	10	24	26.11
6	*Parent plant* ...	*1*	*23*	*24.30*
	Vegetative progeny ...	10	24	25.12
7	*Parent plant* ...	*1*	*23*	*24.20*
	Vegetative progeny ...	10	15	28.73
	do. do. ...	10	18	23.90
	do. do. ...	10	21	24.29
	do. do. ...	10	30	23.64
8	*Parent plant* ...	*1*	*23*	*26.10*
	Vegetative progeny ...	10	12	23.85
	do. do. ...	10	24	26.08

While the original planting of the vegetative progeny was not planned according to the principles of field experimentation a statistical examination of the results was undertaken with a view to ascertaining (a) whether there was any correlation between ether extract of root and age of plant, and (b) if the vegetative progeny of any particular parent plant was sufficiently outstanding to be propagated as a clone.

Table IX.

Ether Extract of Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Serdang.

(Moisture-free basis)

Parent Plant No. 9, 23 to 24 months, 29.60 per cent.					
Serial No. of Vegetative Progeny	Age of Plants				
	15 months	18 months	21 months	26 months	30 months
	per cent.	per cent.	per cent.	per cent.	per cent.
1 ...	29.32	29.80	33.34	26.92	26.50
2 ...	27.97	28.82	28.17	28.26	30.76
3 ...	27.90	27.42	28.64	25.76	25.03
4 ...	25.05	29.97	28.17	26.54	25.35
5 ...	31.62	26.40	30.98	26.91	28.78
6 ...	31.36	26.51	29.53	28.36	28.20
7 ...	26.73	28.18	26.61	25.08	28.76
8 ...	29.39	27.23	27.69	26.86	23.96
9 ...	29.21	26.99	29.77	25.51	25.19
10 ...	30.85	28.55	30.16	26.43	26.71
Maximum ...	31.62	29.97	33.34	28.36	30.76
Minimum ...	25.05	26.40	26.61	25.08	23.96
Average ...	28.94	27.99	29.31	26.66	26.92

Table X.

Ether Extract of Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Serdang.

(Moisture-free basis)

Parent Plant No. 14, 23 to 24 months, 28.50 per cent.					
Serial No. of Vegetative Progeny	Age of Plants				
	15 months	18 months	21 months	26 months	30 months
	per cent.	per cent.	per cent.	per cent.	per cent.
1 ...	30.42	28.04	26.77	26.97	23.66
2 ...	32.74	29.17	29.49	27.58	23.55
3 ...	29.55	26.07	28.84	26.74	30.11
4 ...	29.96	27.75	30.60	27.20	30.49
5 ...	27.92	31.17	29.14	26.78	28.13
6 ...	30.62	29.08	27.89	26.02	28.76
7 ...	30.45	28.77	30.45	26.84	24.26
8 ...	29.73	28.95	28.57	26.23	25.82
9 ...	30.23	26.16	27.97	26.16	29.71
10 ...	28.28	24.74	27.27	27.08	27.54
Maximum ...	32.74	31.17	30.60	27.58	30.11
Minimum ...	27.92	24.74	26.77	26.02	23.55
Average ...	29.99	27.99	28.70	26.76	27.20

With regard to correlation between ether extract of root and age of plant, Tables IX and X record the figures for the ether extract of root at different ages from ten members of the vegetative progeny of parent plants Nos. 9 and 14 respectively.

As a result of the analysis of variance of the figures the calculated value of z for the vegetative progeny of both parent plants is greater than the corresponding values in Fisher's table for both the 5 per cent. and 1 per cent. points of distribution of z, as the figures in Table XI show(3). The decrease in the ether extract can be attributed to increase in age and not to chance.

Table XI.

Summary of Results of Analysis of Variance of Ether Extract of Marketable Root of the Vegetative Progeny of Parent Plants Nos. 9 and 14 of *Derris elliptica*, Changi No. 3, at Serdang.

Parent Plant No.	Value of z		
	Calculated	Fisher's Table	
		5 per cent. point	1 per cent. point
9 ...	0.75	0.48	0.67
14 ...	0.87		

In the case of the vegetative progeny of parent plant No. 9 the minimum significant difference was found to be 1.65 per cent. Referring to Table IX it can be seen that the decrease in the percentage of ether extract after 21 months is therefore significant.

The minimum significant difference for the vegetative progeny of parent plant No. 14 was found to be 1.60 per cent. Reference to Table X shows two significant decreases in the ether extract in this case, the first decrease between 15 and 18 months and the second between 21 and 26 months.

Combining the results for both vegetative progeny the figures show that with this race of Derris the ether extract tends to decrease with age after 21 months. Only an experiment planned according to the principles of field experimentation can, however, decide this point and such an experiment has been laid down at Serdang.

With regard to the question of an outstanding vegetative progeny suitable for clonal propagation on an ether extract basis reference to Table VII shows that at 23 months there are 7 groups of plants and at 25 months 8 groups of plants available. Table XII shows the average figures for these 15 groups arranged in order of merit according to the respective ages of plants.

Table XII.

Average Ether Extract of Marketable Root for Groups of Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Serdang.

(Moisture-free basis)

Reference No. of Plant	Age of Plants	Ether Extract
	months	per cent.
12 ...		28.42
20 ...		26.77
31 ...		26.63
79 ...	23	26.32
2 ...		25.93
76 ...		25.87
10 ...		24.47
73 ...		26.88
74 ...		26.81
77 ...		26.49
104 ...	25	26.17
39 ...		25.99
51 ...		25.51
71 ...		23.96
52 ...		23.16

With regard to the groups of plants aged 23 months a statistical analysis shows that the vegetative progeny of parent plant No. 12 is significantly superior in respect of ether extract to those of parent plants Nos. 2, 76 and 10. The vegetative progeny of parent plants Nos. 20 and 31 are also superior to that of parent plant No. 10.

In the case of the groups of plants aged 25 months a similar analysis shows the vegetative progeny of parent plant No. 73 to be significantly superior in respect of ether extract to those of parent plants Nos. 51, 71 and 52. The vegetative pro-

geny of parent plants Nos. 74 and 77 are similarly superior to those of parent plants Nos. 71 and 52, while the vegetative progeny of parent plants Nos. 104, 39 and 51 are likewise superior to that of parent plant No. 52.

(c) Rotenone Content of Root.

Unlike ether extract, it is not possible, in the experiment, to effect a comparison of the rotenone content of a parent plant and its vegetative progeny owing to the unreliability of the method used for determination of rotenone when the parent plants were being analysed.

Reference to this question was made when discussing the results of analysis of roots of plants of *D. malaccensis* var. *sarawakensis* and *D. elliptica,* Sarawak creeping(2).

Tables XIII and XIV illustrate the range of variation found with plants of different ages at Serdang and Kuala Lumpur respectively. Thus, at Serdang with the vegetative progeny of parent plant No. 9, aged 18 months, there is a difference of about 2.5 per cent. between the maximum and minimum figures of the series, plants Nos. 6 and 5 respectively.

In the case of Kuala Lumpur plants the variations are still more marked. Thus, with the vegetative progeny of parent plant No. 2, aged 30 months, there is a difference of nearly 4 per cent. between the maximum and minimum figures of the series, plants Nos. 9 and 10 respectively.

As with ether extract, a statistical examination of the results of the rotenone determinations was undertaken to ascertain (a) whether there was any correlation between rotenone content of root and age of plant, and (b) if the vegetative progeny of any particular parent plant was sufficiently outstanding in this respect to be propagated as a clone.

With regard to correlation between rotenone content of root and age of plant Tables XV and XVI record the figures for the rotenone content of root at different ages from ten members of the vegetative progeny of parent plants Nos. 9 and 14 respectively.

As a result of the analysis of variance the calculated value of z for the vegetative progeny of both parent plants was found to be greater than the corresponding values in Fisher's table for both the 5 per cent. and 1 per cent. points of distribution of z as the figures in Table XVII show (3). The decrease in the rotenone content can be attributed to increase in age and not to chance.

The minimum significant differences for the two vegetative progeny were found to be 0.36 per cent. for that of parent plant No. 9 and 0.32 per cent. for that of parent plant No. 14. In both cases the figures show two significant decreases as regards rotenone content, the first between 15 and 18 months and the second after 21 months.

Table XIII.

Variation in Rotenone Content of Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Serdang.

(Moisture-free basis)

Serial No. of Vegetative Progeny	Age of Plants	Rotenone Content	
		Parent Plant No. 9	*Parent Plant No. 14*
	months	per cent.	per cent.
1 ...	18	13.10	11.93
2 ...		12.54	12.53
3 ...		12.26	13.53
4 ...		10.94	12.05
5 ...		10.90	13.26
6 ...		13.42	12.64
7 ...		11.69	12.26
8 ...		11.45	12.71
9 ...		11.38	13.24
10 ...		12.49	12.49
Maximum ...		13.42	13.53
Minimum ...		10.90	11.93
Average ...		12.02	12.66
		Parent Plant No. 73	*Parent Plant No. 74*
1 ...	25	13.82	10.97
2 ...		12.43	12.17
3 ...		13.20	10.99
4 ...		12.18	11.44
5 ...		12.51	12.50
6 ...		11.49	12.81
7 ...		11.72	12.37
8 ...		11.65	12.79
9 ...		12.73	13.24
10 ...		12.20	12.80
Maximum ...		13.82	13.24
Minimum ...		11.49	10.97
Average ...		12.39	12.21
		Parent Plant No. 2	*Parent Plant No. 10*
1 ...	30	12.83	10.78
2 ...		13.45	10.96
3 ...		13.66	10.03
4 ...		13.80	11.03
5 ...		12.74	10.68
6 ...		11.41	9.81
7 ...		12.15	10.33
8 ...		11.19	11.39
9 ...		12.21	10.71
10 ...		9.79	10.63
Maximum ...		13.80	11.39
Minimum ...		9.79	9.81
Average ...		12.32	10.64

Table XIV.

Variation in Rotenone Content of Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Kuala Lumpur.

(Moisture-free basis)

Serial No. of Vegetative Progeny	Age of Plants	Rotenone Content	
		Parent Plant No. 3	*Parent Plant No. 8*
	months	per cent.	per cent.
1 ...		7.71	9.30
2 ...		8.84	9.07
3 ...		7.98	11.41
4 ...		8.62	10.51
5 ...	12	*	10.19
6 ...		*	*
7 ...		*	9.17
8 ...		*	9.17
9 ...		8.78	8.74
10 ...		*	7.48
Maximum ...			11.41
Minimum ...			7.48
Average ...		8.39	9.48
		Parent Plant No. 2	*Parent Plant No. 7*
1 ...		11.72	12.62
2 ...		12.59	6.91
3 ...		13.88	9.49
4 ...		12.24	13.91
5 ...	21	13.25	13.53
6 ...		12.81	11.66
7 ...		12.04	14.08
8 ...		12.75	12.66
9 ...		12.75	13.39
10 ...		7.63	12.52
Maximum ...		13.88	14.08
Minimum ...		7.63	6.91
Average ...		12.17	12.01
1 ...		11.05	9.28
2 ...		10.84	11.02
3 ...		10.55	11.85
4 ...		11.51	9.39
5 ...	30	10.09	10.78
6 ...		9.19	10.33
7 ...		10.31	6.85
8 ...		11.17	10.40
9 ...		12.41	11.31
10 ...		8.69	10.14
Maximum ...		12.41	11.31
Minimum ...		8.69	6.85
Average ...		10.58	10.14

* Insufficient root for determination of rotenone.

Table XV.

Rotenone Content of Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Serdang.

(Moisture-free basis)

Parent Plant No. 9.

Serial No. of Vegetative Progeny	Age of Plants				
	15 months	18 months	21 months	26 months	30 months
	per cent.	per cent.	per cent.	per cent.	per cent.
1 ...	12.49	13.10	13.83	11.57	9.76
2 ...	12.91	12.54	12.51	13.17	11.02
3 ...	12.30	12.26	12.84	11.43	11.05
4 ...	10.87	10.94	12.64	12.11	9.85
5 ...	13.14	10.90	13.15	11.93	11.18
6 ...	13.82	13.42	12.51	13.06	13.02
7 ...	12.38	11.69	12.55	10.80	12.08
8 ...	12.76	11.45	12.57	11.16	11.85
9 ...	12.17	11.38	13.91	11.08	10.50
10 ...	12.95	12.49	12.48	11.84	11.51
Maximum ...	13.82	13.42	13.91	13.17	13.02
Minimum ...	10.87	10.90	12.48	10.80	9.76
Average ...	12.58	12.02	12.90	11.82	11.18

Table XVI.

Rotenone Content of Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Serdang.

(Moisture-free basis)

Parent Plant No. 14.

Serial No. of Vegetative Progeny	Age of Plants				
	15 months	18 months	21 months	26 months	30 months
	per cent.	per cent.	per cent.	per cent.	per cent.
1 ...	13.46	11.93	12.03	12.15	10.08
2 ...	15.25	12.53	12.37	12.53	10.09
3 ...	13.13	13.53	12.87	11.89	12.47
4 ...	13.93	12.05	14.31	12.13	12.43
5 ...	13.46	13.26	13.50	11.42	11.67
6 ...	13.58	12.64	13.49	11.28	12.03
7 ...	12.71	12.26	13.59	12.66	10.97
8 ...	12.24	12.71	13.11	12.17	11.28
9 ...	13.39	13.24	12.89	12.02	12.95
10 ...	13.55	12.49	12.69	12.25	12.30
Maximum ...	15.25	13.53	14.31	12.66	12.95
Minimum ...	12.24	11.93	12.03	11.28	10.08
Average ...	13.47	12.66	13.09	12.05	11.63

Table XVII.

Summary of Results of Analysis of Variance of Rotenone Content of Marketable Root of the Vegetative Progeny of Parent Plants Nos. 9 and 14 of *Derris elliptica*, Changi No. 3, at Serdang.

Parent Plant No.	Value of z		
	Calculated	Fisher's Table	
		5 per cent. point	1 per cent. point
9 ...	0.97	0.48	0.67
14 ...	1.21		

As with ether extract, the results indicate that with this race of Derris the rotenone content tends to decrease with age sometime after 21 months. As pointed out previously, the experiment at Serdang planned according to the principles of field experimentation will decide this point.

With regard to the possibility of an outstanding vegetable progeny suitable for clonal propagation on a rotenone basis the results show that at 23 months there are 7 groups of plants and at 25 months 8 groups of plants to be considered. Table XVIII shows the average figures for these 15 groups arranged in order of merit according to the respective ages of the plants.

Table XVIII.

Average Rotenone Content of Marketable Root for Groups of Individul Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Serdang.

(Moisture-free basis)

Reference No. of Plant.	Age of Plants.	Ether Extract
	months	per cent.
12 ...		12.93
20 ...		12.08
31 ...	23	11.86
10 ...		11.77
76 ...		11.75
79 ...		11.33
2 ...		11.06
73 ...		12.39
51 ...		12.34
74 ...		12.21
39 ...	25	11.89
77 ...		11.76
104 ...		10.84
71 ...		10.64
52 ...		10.16

With regard to the groups of plants aged 23 months a statistical analysis shows that the vegetative progeny of parent plant No. 12 is significantly superior to all the others. The vegetative progeny of parent plant No. 20 is similarly superior to that of parent plant No. 2.

In the case of the groups of plants aged 25 months a similar analysis shows the vegetative progeny of parent plants Nos. 73, 51, and 74 to be significantly superior to those of parent plants Nos. 104, 71 and 52. The vegetative progeny of parent plant No. 39 is similarly superior to those of parent plants Nos. 71 and 52, while the vegetative progeny of parent plant No. 77 is significantly superior to that of No. 52.

(d) Correlation between Rotenone and Ether Extract.

Although the results of analysis for the individual plants indicate a wide range of variation between the proportion which the amount of rotenone bears to the ether extract, average figures for root of different ages would appear to be in relatively close agreement.

Tables XIX and XX illustrate the range of variation found with three series of plants of different ages at Serdang and Kuala Lumpur respectively. Thus, at Serdang with the vegetative progeny of parent plant No. 14, aged 18 months, there is a difference of about 9.5 per cent. between the maximum and minimum figures in the series, plants No. 3 and 5 respectively. At Kuala Lumpur with the vegetative progeny of parent plant No. 7, aged 21 months, there is a difference of about 7.5 per cent. between the maximum and minimum figures in the series, plants Nos. 7 and 6 respectively.

Based on the present method for the estimation of rotenone(2) the results obtained in the present investigation indicate that the proportion of rotenone to ether extract for this race of Derris is of the order of 45 per cent., although the figures for roots of individual plants may vary within a range of 10 per cent. of that proportion.

Summary of Results of Investigation.

The results of the investigation may be summarized as follows:—

(a) *Yield of Root.*

(i) Both at Serdang and Kuala Lumpur wide variations were found at all ages between the weights of root from individual plants of the same vegetative progeny.

(ii) These variations apply equally to the two spacing distances, 6 ft. x 4 ft. at Serdang and 3 ft. x 3 ft. at Kuala Lumpur.

(iii) Contrary to the results obtained at Serdang with *D. malaccensis* var. *sarawakensis* and *D. elliptica*, Sarawak creeping, there is no corresponding increase in the average weight of root for an individual plant of a vegetative progeny of this race of Derris at a wider spacing compared with the more closely spaced parent plant at the same age. Wider spacing does not therefore necessarily result in an increased yield of root per plant.

Table XIX.

Relationship between Rotenone Content and Ether Extract for Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Serdang.

(The figures for rotenone and ether extract are calculated on a moisture-free basis)

Parent Plant No.	Serial No. of Vegetative Progeny	Age of Plants	Rotenone	Ether Extract	Proportion of Rotenone to Ether Extract
		months	per cent.	per cent.	per cent.
14	1 ...	18	11.93	28.04	42.6
	2 ...		12.53	29.17	43.0
	3 ...		13.53	26.07	51.9
	4 ...		12.05	27.75	43.4
	5 ...		13.26	31.17	42.5
	6 ...		12.64	29.08	43.5
	7 ...		12.26	28.77	42.6
	8 ...		12.71	28.95	43.9
	9 ...		13.24	26.16	50.6
	10 ...		12.49	24.74	50.4
	Maximum ...		13.53	31.17	51.9
	Minimum ...		11.93	24.74	42.5
	Average ...		12.66	27.99	45.4
73	1 ...	25	13.82	27.61	50.0
	2 ...		12.43	27.55	45.1
	3 ...		13.20	28.44	46.4
	4 ...		12.18	27.62	44.1
	5 ...		12.51	25.92	48.3
	6 ...		11.49	26.66	43.1
	7 ...		11.72	27.27	43.0
	8 ...		11.65	25.61	45.5
	9 ...		12.73	26.33	48.4
	10 ...		12.20	25.82	47.3
	Maximum ...		13.82	28.44	50.0
	Minimum ...		11.49	25.61	43.0
	Average ...		12.39	26.88	46.1
2	1 ...	30	12.83	28.96	44.4
	2 ...		13.45	29.80	45.1
	3 ...		13.66	30.39	44.9
	4 ...		13.80	31.05	44.6
	5 ...		12.74	29.47	43.2
	6 ...		11.41	24.71	46.2
	7 ...		12.15	25.82	47.0
	8 ...		11.19	24.66	45.4
	9 ...		12.21	22.39	54.5
	10 ...		9.79	23.96	41.8
	Maximum ...		13.80	31.05	54.5
	Minimum ...		9.79	22.39	41.8
	Average ...		12.32	27.12	45.7

Table XX.

Relationship between Rotenone Content and Ether Extract for Marketable Root from Individual Plants of *Derris elliptica*, Changi No. 3, of Different Ages at Kuala Lumpur.

(The figures for rotenone and ether extract are calculated on a moisture-free basis)

Parent Plant No.	Serial No. of Vegetative Progeny	Age of Plants	Rotenone	Ether Extract	Proportion of Rotenone to Ether Extract
		months	per cent.	per cent.	per cent.
8	1 ...	12	9.30	23.52	39.6
	2 ...		9.07	23.05	39.3
	3 ...		11.41	25.42	41.3
	4 ...		10.51	26.29	40.0
	5 ...		10.19	25.60	39.8
	7 ...		9.17	24.08	38.1
	8 ...		9.17	24.07	38.1
	9 ...		8.74	20.65	42.3
	10 ...		7.48	18.77	39.9
	Maximum ...		11.41	27.05	42.3
	Minimum ...		7.48	18.77	38.1
	Average ...		9.45	23.85	39.8
7	1 ...	21	12.62	26.34	47.9
	2 ...		6.91	13.86	49.9
	3 ...		9.49	19.14	49.6
	4 ...		13.91	27.67	50.3
	5 ...		13.53	26.69	50.7
	6 ...		11.66	25.02	46.6
	7 ...		14.08	26.07	54.0
	8 ...		12.66	26.26	48.2
	9 ...		13.39	26.95	49.7
	10 ...		12.52	24.85	50.4
	Maximum ...		14.08	27.67	54.0
	Minimum ...		6.91	13.86	46.6
	Average ...		12.01	24.29	49.7
2	1 ...	30	11.05	24.23	45.6
	2 ...		10.84	23.04	47.1
	3 ...		10.55	23.48	44.9
	4 ...		11.51	25.54	45.0
	5 ...		10.09	22.40	45.0
	6 ...		9.19	20.16	45.6
	7 ...		10.31	22.02	46.8
	8 ...		11.17	23.35	47.8
	9 ...		12.41	22.75	54.5
	10 ...		8.69	19.03	45.7
	Maximum ...		12.41	25.54	54.5
	Minimum ...		8.69	19.03	44.9
	Average ...		10.58	22.60	46.8

(b) *Ether Extract of Root.*

(i) The development of ether extract takes place at a much earlier age than previously anticipated. Thus, the proportion of ether extract for the parent plant at 23 to 24 months may be less than that of one member of its vegetative progeny at 12 months.

(ii) Wide variations in ether extract exist between a parent plant and any member of its vegetative progeny, also between any two members of the progeny selected at random. In the case of the Kuala Lumpur plants a difference of nearly 14 per cent. was found.

(iii) These variations are found with both distances of planting.

(iv) Evidence is adduced to show that a low ether extract for one member of a vegetative progeny is not necessarily perpetuated, provided the plant is derived from a strain originally characterized by a high ether extract.

(v) A statistical examination of the figures for ether extract for the vegetative progeny of two parent plants shows a significant decrease in this respect after the age of 21 months.

(vi) A statistical examination of the figures for ether extract for two groups of vegetative progeny from different parent plants harvested at 23 and 25 months shows the vegetative progeny of some of the parent plants to be significantly superior to others in the same group.

(c) *Rotenone Content of Root.*

(i) Comparative figures for rotenone for parent plant and vegetative progeny are not available owing to the unreliability of the method previously used.

(ii) As with ether extract, the results indicate the possibility of a relatively wide difference in rotenone content between any two members of a vegetative progeny selected at random.

(iii) These variations are found with both distances of planting.

(iv) As in the case of ether extract, a statistical examination of the figures for rotenone for the vegetative progeny of two parent plants shows a significant decrease after the age of 21 months.

(v) As in the case of ether extract, a statistical examination of the figures for two groups of vegetative progeny from different parent plants harvested at 23 and 25 months shows the vegetative progeny of some of the parent plants to be significantly superior to others in the same group.

(d) *Correlation between Rotenone and Ether Extract.*

(i) Wide variations are found in this respect between the figures for the individual members of a vegetative progeny.

(ii) As far as the present investigation is concerned, the average figure for the proportion of rotenone to ether extract for this race of Derris would appear to be about 45 per cent. This figure appears to be independent both of the age of the plants and the spacing adopted.

Discussion.

Although there are comparatively wide variations both in the yield of root and toxic content between individual plants, for which at present no explanation can be offered, the results indicate that the average toxic content of a mixed population remains of the same order from generation to generation.

The average figures for all the Serdang plants analysed are approximately as follows:—

	moisture-free basis per cent.
Rotenone	12.0
Ether extract	26.0

On a 10 per cent. moisture basis, which may be taken as an average figure for commercial consignments of root, the above figures would be reduced to rotenone 10.8 per cent. and ether extract 23.4 per cent.

It is unfortunate that at the present time there is only a limited market for root with such a high rotenone content. As pointed out previously(4), a medium grade root, for example, rotenone 6 per cent., ether extract 22 per cent., satisfies the present market requirements of the trade in England and the United States of America, and dealers are therefore unable to offer a price which the grower considers commensurate with the high quality of his product.

Such high quality root as *D. elliptica*, Changi No. 3, is likely to receive a fair price only in the event of derris extracts or impregnated dusts becoming of more general use. The first stage in the preparation of such a product is solvent extraction of the powdered root for which a root rich in rotenone and ether extract is eminently suitable.

Outline of Further Work.

The isolation of a clone in which high yield of root is combined with high toxic content still remains the ultimate objective of the investigation. As a result, the multiplication of stocks of high-quality planting material derived from the mixed vegetative progeny of an individual plant of similar quality is therefore being undertaken. Table XXI gives details of some of the mixed vegetative progeny of individual parent plants which have been established separately at Serdang.

Table XXI.

Details of Mixed Vegetative Progeny of Individual Plants of *Derris elliptica*, Changi No 3, Established at Serdang.

Parent Plant Reference No.	Age of Plants when Harvested	Average Weight of Air-dry Marketable Roots per Plant	Average Rotenone	Average Ether Extract
	months	ozs.	(moisture-free basis) per cent.	per cent.
12	23	14.58	12.93	28.42
73	25	19.53	12.39	26.88
74	25	13.81	12.21	26.81
51	25	14.77	12.34	25.51
14	26	13.76	12.05	26.76

As indicated previously, experiments are also being laid down to endeavour to correlate yield of root and toxic content at different ages with different planting distances.

This is important from an estate point of view in which the maximum yield of toxic content per acre in the shortest period is the chief consideration.

As already stated, no explanation can be offered at present for the wide variations in the figures both for yield of root and toxic content of members of one vegetative progeny. Following a suggestion by Dr. T. W. Brown, Botanist, Serdang, small scale experiments will be laid down to ascertain the extent to which these characters are influenced by the size of the original cutting.

Acknowledgments.

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LIVESTOCK ON ESTATES

BY
H. WALKER,
Manager, Kampar Estate, Perak.

It is a known fact that managers of estates refuse to allow their labourers to keep livestock owing to risk of damage to young rubber plants, either in new or replanted areas. This can be quite understood but I think the method of control employed on my estate can be claimed to have overcome the difficulty and I give details below.

Goats.

Before a labourer is allowed to bring goats into the estate, he must first obtain permission from the manager. The manager points out the difficulty of control and asks his labourers how many wish to keep goats if permission is given. If the number of goats is less than, say, 30, control is difficult but a start can be made with this number. The procedure is that each would-be owner of goats must agree beforehand to pay so much per animal to a goatherd who will assume responsibility. With a small number it may be necessary to fix the rate at 20 cents per head a month and employ a boy or youth as herdsman. As the number increases—and increase it will—the boy can give place to a man and this is the state to be aimed at. As an example, my labourers started with about 30 goats and paid 20 cents a head: now there are 177 goats and owners pay 10 cents per month for a full-sized goat and 5 cents for a kid. It will be seen, therefore, that the herdsman gets quite a reasonable salary which will increase as the goats multiply. The introduction of the compulsory scheme of contribution from all owners of cattle to a herdsman is not resented in the least and gives the management more control.

The duties of the herdsman are to open up the pens in the morning, muster all the goats and drive them to the grazing ground. This place can be controlled by the management in such a way that the same area is not grazed over each day; in other words the estate can be split up into, say, seven areas so that the grass in each area has a chance to recover. He will stay with the herd all day and drive them home in the evening when the owners are present to pen them up for the night. The herdsman is also responsible for seeing that the animals do not stray into forbidden areas or on to adjoining properties.

A list of goat owners is kept showing the numbers of goats and is revised monthly. On pay day, each owner pays the amount due by him and this is collected by the management and handed over to the herdsman.

Housing.

Sites for the pens are chosen by the management in conjunction with the visiting doctor: they are in the vicinity of the lines but not near enough to be

injurious to the health of the population. The pens are cheaply constructed and need not be elaborate. On most estates there is a jungle area where suitable timber is available and *ataps* can usually be obtained from old buildings which are being renovated. The practice is for several owners to join together and build a pen of suitable size for their stock. By so doing, the number of pens is minimized and the cost to the owners is their own labour plus a few nails and floor planks, the latter being moveable for easy cleaning and exposure to sunlight occasionally.

Meat.

So far there has been no sale of goats for slaughter in the markets but usually a number of labourers join together and slaughter one or more and divide up the meat for their own consumption. By doing this they become self supporting for meat which can be relied upon as being fresh.

Purchase.

Loans for the purpose of purchasing goats are obtained from the Estate Labourers' Co-operative Society; these loans are encouraged by the Society officers and usually approved by the manager. The committee of the Society is responsible for seeing that the loans are used for the purpose granted and report accordingly to the management.

Cows.

The same procedure as for goats is adopted in respect of cows, but the cost per head payable to the herdsman is higher. At the moment my labourers have 22 cows, and the owners pay 50 cents per head per month. This is not unreasonable, as I am given to understand that a healthy cow will give an average of 75 bottles of milk monthly. This is readily sold at 10 cents per bottle or a return of $7.50 gross per month to the owner, not to mention periodic increases in his stock.

Disease.

Over the last 3 or 4 years there has been practically no disease amongst livestock on this estate. Veterinary officers gladly visit estates upon request and advise treatment for any disease together with advice as to breeding and general husbandry.

General.

In conclusion, it may be said by many managers that all this causes extra work. Perhaps it does a little but four points should be borne in mind:—

(i) Livestock represents labourers' savings, and possession makes them happier and more contented as they are accustomed to keeping livestock in India.

(ii) Livestock provides a supply of fresh milk which is so desirable for children and mothers.

(iii) Livestock provides a ready supply of fresh meat, saves the cost of purchase in the open market and helps to balance the rations of the labour force.

(iv) Livestock provides quite an appreciable amount of manure which, returned to the labourers' allotments, improves growth of vegetables and other foodstuffs. This encourages the growing of more foodstuffs which is in itself a very important point.

Statistics show that at least 35 per cent. of the goats slaughtered in Malaya are imported, and a little encouragement to those who wish to keep animals on estates would help to reduce this import. Thus more money would be retained in the country and the spending power of those who breed livestock in their spare time increased. This is particularly important during the present national emergency and I hope that my article may assist in winning this economic war.

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CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA.

4th Quarter, 1939.

Prepared by the Economics Branch of the Department of Agriculture, S.S. & F.M.S., in collaboration with the Field Branch of the Department.

Rainfall.

The last quarter of the year is usually characterized by heavy rainfall, and, except in a few localities, October and November were normally wet months. December, on the other hand, in most parts of the country was exceptionally dry.

Selangor experienced dry weather throughout the quarter, approaching to drought conditions in December. In Perak South also, October and November were exceptionally dry months, while rainfall in December was very unevenly distributed.

In Johore there was extensive flooding in October in the coastal districts of Johore North, and heavy December rains in Mersing District. Johore Bahru also was wet in December.

In Pahang, Pekan experienced very heavy rains throughout the quarter. In Kelantan, October and November were drier than usual, but December rainfall was normal.

Prices.

Prices paid during the quarter for small-holding rubber are summarized in Tables I and II.

The price of coupons varied during the quarter. In Province Wellesley and Penang they were quoted at $25 per picul equivalent. The Perak Central report states that coupons declined appreciably in value during October but quickly recovered; actual quotations are not, however, given. In Kelantan the price of coupons rose from $24 in October to $29 in November, but fell to $24 again towards the end of December. In Kedah, coupon values were as follows: October $19 to $23.50; November $23.50 to $33; December $28.50 to $31.

The Perak South report quoted uncouponed rubber at $13 to $15.50 per picul.

Production and Quality of Rubber.

Table III summarizes production of rubber on small holdings during the quarter and for the year as a whole. It will be seen that production in the quarter under review was lower than in the 3rd quarter, and was only 28.7 per cent. of total production for the quarter as compared with 39 per cent. in the previous quarter. This decrease was partly due to the shortage of coagulants to which reference will be made later.

Table I.

Highest and Lowest Rubber Prices Paid by Local Rubber Dealers.

(In Straits dollars per picul of 133 1/3 lbs.)

4th Quarter 1939.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore	Kelantan
				OCTOBER					
Smoked sheet	46.00-48.00	38.50-49.00	40.00-47.00	39.00-46.00	38.00-46.20	43.00-47.70	40.50-48.80	36.00-45.25	39.00-43.80
Unsmoked sheet	40.00-47.50	37.00-44.00	36.00-45.00	37.00-45.00	36.00-44.50	41.60-46.50	37.00-46.50	35.00-44.40	36.00-41.30
Scrap	26.00-34.00	32.00-34.00	26.00-35.00	—	—	31.50-36.00	26.00-35.00	27.00-34.50	27.00-31.00
				NOVEMBER					
Smoked sheet	49.25-52.75	39.00-51.00	43.00-50.25	44.50-50.00	40.50-49.80	48.00-51.50	44.00-53.00	38.75-49.00	43.50-48.00
Unsmoked sheet	46.00-51.50	38.00-49.00	43.60-49.00	43.00-48.00	38.60-47.50	46.50-50.50	42.00-49.00	37.50-48.00	41.50-46.00
Scrap	32.00-39.00	32.50-34.50	35.00-38.00	—	—	36.00-40.00	27.00-40.00	29.00-40.80	27.50-33.00
				DECEMBER					
Smoked sheet	49.50-52.00	43.00-52.50	43.00-51.00	45.00-50.00	45.00-50.00	50.40-51.50	47.00-51.50	42.30-50.00	48.00-49.50
Unsmoked sheet	48.00-51.70	40.00-51.00	43.50-48.50	44.00-48.50	42.00-49.00	48.50-50.85	44.00-48.50	40.80-49.00	45.50-47.00
Scrap	35.00-39.00	30.00-32.00	22.00-36.00	—	—	38.00-42.00	30.00-38.00	34.00-41.00	29.00-34.00

Table II.

Mean of Highest and Lowest Rubber Prices Paid by Local Dealers at a number of Centres in each State.

(In Straits dollars per picul of 133 1/3 lbs.)

4th Quarter 1939.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore	Kelantan
				OCTOBER					
Smoked sheet	46.75-48.00	40.11-45.27	43.08-45.83	41.60-45.80	39.25-44.58	45.67-47.40	42.20-45.95	39.00-44.11	39.00-42.40
Unsmoked sheet	42.25-46.12	37.85-43.15	39.50-42.60	38.74-44.30	37.70-43.00	43.37-45.50	40.15-44.10	37.62-42.62	36.25-39.65
Scrap	29.33-32.83	32.00-34.00	26.00-35.00	—	—	33.17-34.17	28.20-31.62	29.00-32.77	27.00-39.50
				NOVEMBER					
Smoked sheet	49.63-52.38	44.28-48.63	45.85-48.39	45.70-49.30	44.28-48.38	49.17-50.83	46.18-50.68	43.75-48.07	45.50-48.00
Unsmoked sheet	46.75-50.75	42.97-46.62	44.34-46.64	43.80-47.40	42.02-46.30	47.67-49.17	44.12-48.18	42.11-46.57	42.75-45.50
Scrap	32.67-36.37	32.50-34.50	35.00-38.00	—	—	37.83-39.50	30.75-36.25	33.56-37.60	29.25-31.00
				DECEMBER					
Smoked sheet	50.25-51.75	45.88-49.16	46.83-48.92	46.80-48.60	46.30-48.80	50.58-51.17	47.32-49.92	45.56-48.80	48.25-49.25
Unsmoked sheet	48.50-50.68	44.04-46.63	44.70-46.40	45.60-47.20	44.89-46.75	48.85-49.95	45.08-47.92	43.94-47.57	45.75-47.00
Scrap	35.33-37.33	30.00-32.00	22.00-36.00	—	—	39.17-41.17	32.38-35.50	35.83-38.08	30.25-32.50

Table III
Production of Rubber on Small Holdings.
(in tons)

	Total 1938	1st Quarter 1939	2nd Quarter 1939	3rd Quarter 1939	4th Quarter 1939	Total 1939
Federated Malay States ...	54,330	10,875	9,729	18,601	12,564	51,769
Straits Settlements ...	9,906	2,123	2,054	2,888	2,885	9,950
Unfederated Malay States ...	50,442	11,450	10,562	17,347	15,491	54,850
TOTAL MALAYA ...	114,678	24,448	22,345	38,836	30,940	116,569

The Pahang report states that the trend during the quarter has been to dispose of the sheet as quickly as possible after preparation, and, generally, smoking has not been widely practised, particularly in the riverine mukims. The report continues that some deterioration has taken place in the quality of sheet produced. Most of the smoke houses are accordingly not in use, but in spite of this fact, eleven new smoke houses were erected during the quarter. The co-operative smoke-house in Temerloh District continued to operate, and a further one is planned.

The Perak Central report states that none of the smoke cabinets erected in that Circle are in use.

In Lower Perak the premium for smoked sheet was about $1.50, and the report states that for some obscure reason a Teluk Anson dealer was paying a premium of $2.50 to one smoke-house owner. The Krian report also quotes a premium of $1.50 for smoked sheet in Selama, rising to $2.50 in Krian.

In Kelantan, Asiatic Rubber Instructors and Demonstrators have concentrated on smoke-house construction in view of the continued favourable difference in price between smoked and unsmoked sheet. Efforts towards the production of better quality sheet were hampered, however, by the shortage of acid coagulants. Demands for assistance in constructing smoke houses far exceeded the resources in staff. At the end of the quarter the position was:—existing 54, under construction 23, awaiting construction 36. Capacities vary from 4 to 70 piculs but most of those now being built are of the large types. The great majority are worked co-operatively.

General Conditions on Holdings.

With higher prices prevailing, improvements are being effected in the maintenance of holdings. The Pahang report, stressing this point, states that greater attention to maintenance is now being paid and that the general condition of most

Table IV.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres at the end of December, 1939.

PERAK				SELANGOR				NEGRI SEMBILAN				PAHANG			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Batang Padang	36,187	6,900	19	Klang	16,143	8,600	53	Seremban	23,639	16,300	69	Raub	10,534	7,300	69
Kinta	38,874	7,000	18	Kuala Langat	23,881	6,900	28	Tampin	21,896	15,100	69	Kuala Lipis	15,457	2,500	16
Kuala Kangsar	92,166	9,200	10	Ulu Langat	45,012	24,800	55	Kuala Pilah	31,832	17,200	54	Bentong	12,224	2,300	19
Upper Perak	15,590	1,900	12	Ulu Selangor	31,463	13,200	42	Jelebu	9,097	1,800	20	Other Districts†	40,373	14,800	32
Larut & Selama	43,132	1,700	4	Kuala Lumpur	20,277	7,500	37	Port Dickson	11,133	4,800	43				
Krian	9,408	4,300	46	Kuala Selangor	8,417	2,600	31								
Lower Perak*	26,735	2,700	10												
Dindings	9,873	5,000	51												
	271,965	38,700	14		145,193	63,600	44		97,597	55,200	57		84,588	26,900	32

MALACCA				PENANG & P. WELLESLEY				SINGAPORE			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Central	14,093	5,800	41	North	3,549	400	12	Singapore	20,115	200	1
Alor Gajah	30,838	9,900	32	Central	10,785	3,500	32				
Jasin	25,286	5,300	21	South	8,936	400	4				
				Penang	15,822	300	2				
	70,217	21,000	30		39,092	4,600	12		20,115	200	1

JOHORE	350,007	31,500	9
KEDAH	102,126	6,100	6
KELANTAN	49,133	13,800	28
PERLIS ‡	2,916	600	21
TRENGGANU ‡	29,836	6,300	21

The percentage of areas out of tapping in September, 1939, was as follows:—Perak 28, Selangor 30, Negri Sembilan 59, Pahang 39, Malacca 36, Penang and Province Wellesley 17, Singapore 4, Johore 19, Kedah 27, Kelantan 19.

*Estimated from percentage for Kuala Kangsar.

†Estimated from percentage for other Districts in the State.

‡Estimated from percentage for rest of Malaya.

Table V.
Comparisons of Areas of Rubber Small Holdings Out of Tapping

Territory	December, 1938		September, 1939		December, 1939	
	Acres	Per-centage	Acres	Per-centage	Acres	Per-centage
F.M.S. ...	264,900	44.2	210,000	35.0	184,400	30.7
S.S. ...	46,100	35.6	32.400	25.0	25,800	20.0
U.M.S. ...	147,900	27.7	122,600	21.0	58,300	9.1
Malaya	458,900	36.4	355,000	28.0	268.500	21.0

small holdings is quite satisfactory. The report points out that measures against soil erosion are principally required but that it must be appreciated that small-holders are not always in a position to sink much capital in such measures, although progress is being made. The purchase of cover-crop seed through the Department continues to be popular.

In Province Wellesley clearing is being undertaken in many holdings which have not been tapped for some time.

Tapping.

The results of the quarterly survey of small holdings out of tapping are summarized in Tables IV and V which show a further increase in the number of holdings in tapping.

Tapping was very variable, however, owing to the shortage of coagulants, and one report states that while some holdings went out of tapping on this account, others were almost "slaughter" tapped by owners fortunate enough to possess stocks of acid, in order to take advantage of the increase in prices.

In Pahang, holdings which had for a long period remained untapped were brought into production. The Chinese Rubber Instructor in Pahang suggests that small-holders no longer think that the more bark taken off the greater the yield of latex, but the State Agricultural Officer doubts this view and states that bark consumption per month on the average small holding is still quite generous, although cases of really bad tapping are not now so common as in former years.

In Perak Central Circle cases of severe over-tapping were noticed and owners warned of the probable adverse results of this practice.

Planting.

A considerable amount of replanting and new planting has taken place on small holdings, though with the recent high prices for rubber there has been a tendency to abstain from replanting. Small-holders now realize the desirability of using

proved clonal material for replanting and new planting, and Asiatic Rubber Instructors are giving considerable assistance both with advice and practical demonstrations of budding technique.

In Perak, 4 acres of rubber seedlings (7,000 points per acre) have been established at the Sungei Manik Agricultural Station with a view to budding 1 year hence and to the subsequent supply of budwood at cheap rates to small-holders. Also 80 budded stumps of four proved clones have been planted. There have been a few casualties due to termite attack. In the Parit District of Perak more than 200 budded stumps and 200 yards of budwood (Tj. 1) have been purchased by small-holders from neighbouring estates for multiplication purposes. The rubber nursery at Ayer Tawar Agricultural Station has been extended to 4 acres, and more than 2,400 seedlings have been budded with three approved clones. Many small-holders have visited the Station to see the nursery and to have budgrafting explained to them.

In Kelantan the total area approved for planting by small-holders amounts to 916 acres, of which, at present, it is proposed to bud 242 acres. Interest in replanting is growing.

The Negri Sembilan report states that in a few cases budwood nurseries have been established by Malays, and that fairly extensive preparations for budgrafting are being made by the larger Chinese and Indian-owned holdings.

In Johore, approved applications under the new planting scheme were practically completed by the end of the quarter, but some planting remains to be done in 1940. Areas in excess of 10 acres were subject to special conditions to prevent soil losses by erosion, and work in most cases has been completed in a satisfactory manner.

The Pahang report states that there was not a great deal of interest in replanting. Some small-holders assert that it is more expensive to replant than to undertake new planting, even where share certificates had to be purchased, particularly if there is much *lalang* grass present and taking into account the need for the purchase of fertilizers.

In Bentong District much of the new planting on the new clearings was rushed through before the end of the year with the result that terracing and the establishment of covers has been neglected, which is a serious matter in this hilly district. Budding classes for village youths continued to be popular. Six such youths near Raub have already obtained one contract and achieved 80 per cent. success.

Pests and Diseases.

The wet weather of October and November encouraged the spread of mouldy rot, but the subsequent exceptional dry conditions in December enabled control to be effected satisfactorily.

A report mentions that Cyanogas and perchloride of mercury have been used for the control of termites on budwood nurseries, but the price of the latter has increased since the commencement of the war.

A Johore report states that a much greater measure of attention is now being paid to soil erosion, particularly in areas where new planting is being undertaken.

Root disease continues prevalent in most districts and difficulty is generally experienced in obtaining the satisfactory adoption of control measures. With Chinese small-holders in Pahang, washing the exposed roots with a solution of copper sulphate is a popular measure against root disease. Records of the spread of root disease were continued in Kinta. Deaths in observation plots since May, 1937, vary from 0 to 50 per cent.

In Pahang, white arsenic is now preferred for use against "white ants" and is stocked by the Department. Rats and snails were causing damage to young plants.

The Perak Central report states that some small-holders seem to be beginning to realize the seriousness of the soil erosion problem, and a fair amount of cover-crop seed was bought for them during the quarter. In Parit, however, there are many blocks of newly opened land where soil erosion is taking place and no attempt is being made to take preventive measures.

General.

The widespread shortage of coagulants during the quarter is mentioned in all reports. In some districts the shortage did not become acute until December, and, for example, in Lower Perak small-holders were scarcely affected even up to the beginning of December as adequate supplies of inferior coagulants were available at comparatively normal prices.

In co-operation with the Land Offices the Department of Agriculture took over the distribution of formic acid to small-holders to ensure that all small-holders received a fair share of available supplies. Prior to the intervention of Government to control prices and supply, in some localities as much as $1.50 per pint was demanded by Chinese dealers for formic acid of doubtful strength.

Small-holders are now well aware of the need for careful use of their acid ration, and the use of serum to dilute fresh latex and next-day machining are spreading. The preparation of coagulant from coconut water is being undertaken in districts where coconuts are plentiful, and demonstrations in the use of coconut water as a coagulant were given to small-holders.

As was to be expected sulphuric acid preparations appeared on the market, and the Asiatic Rubber Instructor, North Pahang, rather neatly convinced a group of small-holders of its harmfulness by corroding a few of their pans and zinc utensils.

A venture in co-operative selling in Pahang was successful, and rubber from Pekan was sold in Kuantan where some $3 to $5 per picul above the Pekan price was obtained.

In Johore the sale of latex by small-holders is growing, and the purchase of latex has been organized on a comparatively large scale by a Singapore firm.

Abstract.

THE EXPORT CROPS OF THE NETHERLANDS INDIES IN 1938.

Bulletin No. 175 of the Central Bureau of Statistics of the Netherlands Indies.

In 1938 the total value of all exports from the Netherlands Indies fell from Gs. 951 millions in 1937 to Gs. 658 millions and that of all exports of agricultural products from Gs. 660 millions in 1937 to Gs. 426 millions. Of the Gs. 426 millions, Gs. 257 millions (60.3 per cent.) was estate produce and Gs. 169 millions (39.7 per cent.) was native produce. In 1937 the corresponding figures were respectively 54.3 per cent. and 45.8 per cent., and were rather exceptional; the 1938 position is in close agreement again with the averages for the years 1932-1936.

The value of the exports of mineral products has been fairly steadily increasing in the course of the last decade and the value of the exports of agricultural products has correspondingly decreased. In 1928 the proportions were respectively 15.4 per cent. and 78.5 per cent. of the total value of all exports, whereas for 1938 the figures were 30.9 per cent. and 64.7 per cent. To what extent this affects the internal economic conditions is not stated.

Expressed in percentages of total world exports of important agricultural products, the 1938 exports from the Netherlands Indies were: cinchona 90 per cent., kapok 64 per cent., pepper 85 per cent., rubber 33 per cent., copra 29 per cent., sisal-fibre 25 per cent., tea 17 per cent., oil palm products 24 per cent.

Cane Sugar.

The area planted with pedigree cane to serve as planting material was 5,714 hectares,* and the crop from 915 hectares of this area had to be milled. The total production of cane sugar was 1,375,510 tons† against 1,379,924 tons in 1937. The total exports were 1,071,089 tons against 1,128,834 tons in 1937; unsold stocks consequently have in 1937-1938 increased by fully 555,000 tons.

Native production for home consumption increased slightly again; the planted area increased steadily from 10,782 hectares in 1934 to 15,606 hectares in 1938.

Rubber.

The estate planted area was 595,771 hectares, 529,413 hectares of which were in bearing. A total of 13,998 hectares of old rubber was cut down and a total of 14,822 hectares was planted with superior material. Of the total area planted 177,264 hectares (29.8 per cent.) are budded rubber. Of this latter area 142,457 hectares (80.3 per cent.) were planted before 1935 and 34,807 hectares (19.7 per cent.) were planted in 1935/1938.

* 1 hectare = 2.472 acres.

† Throughout this abstract, "ton" refers to the metric ton of 2,200 lbs.

The native-owned planted area has now been calculated to be 15,040 hectares in Java and 681,187 hectares in the Outer Provinces; of the latter total 629,981 hectares are tappable. Provisionally the figures of the 1936 registration (reviewed in *The Malayan Agricultural Journal*, Vol. XXVI, No. 1, pp. 29-30) are once more given. The revision thereof has not yet been completed.

For 1938 the total basic production was assessed at 548,640 tons, of which 287,324 tons were allotted to estates and 261,316 tons to native producers.

The total 1938 exports decreased greatly as a result of the reduction in the average exportable allowance. They were:—

	Estates tons	Native tons	Total tons
	158,235	147,209	305,444
against allowances of: ...	158,201	147,071	305,272
Excess ...	34	138	172

The quality of the native product exported has further improved to such an extent that the 1938 exports consisted of 97.3 per cent. blanket and sheet and 2.7 per cent. slab, whereas in 1935 the figures were: 62.8 per cent. blanket and sheet, 1.4 per cent. scrap, and 35.8 per cent. slab. The output of the remilling factories in 1938 was 51,843 tons.

Coffee.

The planted estate area was 103,621 hectares, 88,585 hectares (85.6 per cent.) of which is in Java (mostly East-Java). The area of native-owned coffee in Java was 25,567 hectares, that of native-owned coffee in the Outer Provinces is unknown. The estate area has steadily decreased from 123,128 hectares in 1934.

Estate production was 45,579 tons and the export of native-grown coffee from the Outer Provinces was 61,729 tons, 87.5 per cent. of which came from Sumatra.

Owing to unfavourable weather the 1938 coffee crop has been far below the 1937 figure of 132,031 tons. The bulk of the production is Robusta coffee.

Tea.

The planted estate area was 138,319 hectares, 76 per cent. of which is in Java. A total of 136,965 hectares (99 per cent.) is in bearing. No native tea is grown outside Java. The native-owned planted area in Java is estimated at 67,166 hectares, subject to revision in connexion with tea restriction obligations. Of this latter area 65,639 hectares (96 per cent.) is in bearing.

The total estate production, including 12,997 tons dry weight of purchased native-grown leaf to the value of Gs. 4,411,818, was 81,329 tons. The total export was:—Java: 57,383, Outer Provinces 14,538, total 71,921 tons.

Tobacco.

The particular features of this cultivation and of the preparation for export were fully described in Vol. XXII (1934) of this Journal.

The crop of the superior grade of leaf for cigar wrappers which is confined to estate cultivation on the East Coast of Sumatra, amounted to 13,786 tons. In Java the estates produced 13,348 tons of inferior leaf-tobacco, 18.4 tons of which were purchased native-grown leaf, and 13,570 tons crude tobacco, 5,975 tons of which were purchased native-grown leaf.

Furthermore there is a large native output mainly for home consumption; in Java this production was 66,100 tons, 6,105 tons of which were exported.

Cinchona.

The 1938 estate production of dried cinchona bark was 10,955 tons. The total planted estate area is 17,011 hectares, of which 14,985 hectares are in bearing. The exports of native-grown bark were 165 tons dry weight with an average quinine content of 4.97 per cent. and a quinine equivalent of 8,201 kilograms. The Bandoeng quinine factory further purchased 16.6 tons of native-grown bark with an average quinine content of 3.57 per cent., and a quinine equivalent of 592 kilograms.

The total exports from the Netherlands Indies in 1938 were: dry bark 6,957 tons, quinine, crudum and quinine salts 182,287 kgs.

A concise review of the present situation in respect of production in other tropical countries is given.

Oil Palm Products.

Of a total planted area of 92,307 hectares, 74,490 hectares are in bearing. Production amounted to 226,668 tons of oil (palm oil and kernel oil together) and 48,036 tons of kernels. Exports were respectively 220,702 and 47,489 tons. Of the total planted area 90.8 per cent. is in North Sumatra where the average yield of palm oil per hectare in bearing is 3,139 kilograms. This high yield is mainly due to the high oil percentage and low kernel percentage of fruits in Sumatra and to the great degree of perfection of the oil-extracting process there.

The Netherlands Indies in 1938 contributed 45.7 per cent. to the world's exports of palm oil and 7.3 per cent. to that of kernels.

Coconuts.

The estate area in bearing is: Java 6,165 and Outer Provinces 33,076 hectares, a total of 39,241 hectares which in 1938 produced 35,083 tons of copra equivalent. In addition, nuts to a copra equivalent of 28 tons and 14,429 tons of copra were purchased from native growers by estates, bringing their total output up to 49,540 tons of copra equivalent.

Compared with 1937, estate production in Java shows an increase of 30.1 per cent. and that of the Outer Provinces 6.2 per cent.

Though native production in Java and Madura is large, domestic consumption in 1938 left a surplus of only 8,583 tons of copra available for export. The production of copra by the native growers in Java and Madura is estimated to have been 212,200 tons, all of which, except the small export surplus, went to the local oil mills to satisfy domestic consumption. This figure does not include direct domestic consumption of nuts and oil extraction in the small native village oil mills.

The export surplus from the Outer Provinces in 1938 was 592,950 tons, including 29,503 tons of estate produce, leaving a net balance of 563,447 tons of native produce. The total combined Netherlands Indies 1938 export of copra, oil and coconuts amounted to 590,013 tons of copra equivalent.

Essential Oils.

The estate area planted with citronella was 6,800 hectares, of which 6,259 hectares were in bearing; practically all of it is in Java. The native-owned area in Java was 20,686 hectares, 16,833 hectares of which were in bearing.

Estate production was 322,325 kgs. from estate-grown leaf and a further 316,561 kgs., from leaf purchased from native growers, giving a total of 638,886 kgs. The total export from the Netherlands Indies to foreign countries was 1,894,476 kgs., leaving 1,255,590 kgs., to native distillers.

Exports of other essential oils were: cajeput oil 47,339 kgs., vetiver oil 12,752 kgs., patchouli oil 17,722 kgs., turpentine 911,268 kgs., palmarosa oil 4,721 kgs.

Hard-Rope Fibres.

Chiefly sisal, grown on estates. The total export (not excluding refuse) was 88,365 tons. Other fibres 1,769 tons, waste 2,133 tons.

Kapok.

This crop is still predominantly native grown and the cleaning of the fibre from the pod largely a village industry. The bulk of the exports come from Java. Total exports were:—

	Fibre	Seeds	Oil	Oilcake
	tons	tons	tons	tons
	16,344	9,033	1,696	13,254
of which estates produce:	2,515	4,523	nil	nil

Only *Ceiba pentranda* L. Gaertn. is cultivated.

Pepper.

Cultivation is almost entirely in the hands of native and Chinese growers. The 1938 exports were:—

	Black	White	Total
	tons	tons	tons
Sumatra	41,464	659	42,123
Banka and Billiton	740	9,088	9,828
Borneo	114	2,598	2,712
	42,318	12,345	54,663

Tapioca.

This crop is almost exclusively grown by natives in Java for home consumption and only a small surplus is available for export in its various forms.

In 1938 the planted native area of 948,000 hectares, as against 950,000 hectares in 1937, produced the record crop of 8,149,000 tons of fresh tubers (7,637,000 tons in 1937). Only 778,000 tons were available for export as against 1,280,000 tons in 1937, due chiefly to the abundance of wheat and other cereals in Europe and America.

To the figures for planted area and production those relating to estate cultivation for flour manufacture should be added, but they are relatively insignificant. The 1938 exports of tapioca products were: dried tubers 1,717 tons; dried and ground tubers 87,754 tons; flour 137,740 tons; flake and siftings 6,486 tons; pearl and seeds 13,068 tons; fibre residue 16,785 tons.

Coca.

This is exclusively an estate crop, exported as leaf. Production in 1938 was 98,518 kgs. of leaf.

Derris Root.

The planted estate area increased from 1,070 hectares in 1936 to 3,291 hectares in 1938, 918 hectares of which were in bearing. Production rose from 45 tons of root in 1936 to 355 tons in 1938 and export from 177 tons in 1936 to 242 tons in 1938. Three-quarters of the cultivated area is in Java. No figures are given relating to native produce.

Gambier.

This crop is mostly native-grown in the Outer Provinces only, which in 1938 exported a total of 10,972 tons, of which 5,152 tons went to foreign countries, 4,857 tons to Java and 963 tons to other parts in the Outer Possessions. Estate production is said to have been 3,289 tons. It is, however, curious to notice that Java has commenced to import the extract from the leaves and is increasingly manufacturing locally the small cubes of a filler, saturated with this extract, for local consumption. Formerly the Outer Provinces purchased this filler from Java and exported the cubes ready for consumption.

Nutmegs.

No reliable figures for planted area, production and home consumption are available. The 1938 exports were: 2,128 tons shelled nuts, 1,849 tons unshelled nuts, and 722 tons mace. The produce comes chiefly from the Banda Islands group *via* Menado in Northern Celebes.

Arecanuts.

This is entirely a native crop. In 1938, exports from Java were 7,637 tons and from the Outer Provinces 55,228 tons, total 62,865 tons.

Cloves.

Exports from the producing regions in the Outer Possessions were: 330 tons to foreign countries and 622 tons to Java and to other Outer Provinces. In addition Java imported 5,703 tons from foreign countries, chiefly Zanzibar.

Rice.

In 1936 Java for the first time had an export surplus of 96,139 tons of cleaned rice available. In 1937 the surplus was 195,477 tons, and in 1938 it fell to 52,578 tons. On balance the whole of it went to the Outer Possessions, which in 1938 in addition imported from abroad a balance of 370,841 tons which constitutes the Netherlands Indies' deficit for a population of far over 60 millions. Bali, Lombok and Celebes always have a surplus available for export to other parts of the Outer Provinces. Java in 1938 produced a record crop of 4,168,984 tons of cleaned rice from a record planted area of 3,960,000 hectares; 90.2 per cent. of this crop came from sawah land and 9.8 per cent. from ladang land.

Maize.

Maize is exclusively native-grown, 74 per cent. on ladang land and 26 per cent. on sawah land in Java and Madura. Bali, Lombok and Celebes also cultivate this crop.

Though chiefly grown for home consumption, a small surplus is available for export. In 1938 the planted area in Java and Madura was 2,006,000 hectares; production was 1,925,900 tons of cleaned grain and the export surplus was 50,846 tons net after deduction of imports from Outer Possessions. The exports from the Outer Possessions to foreign countries were 44,999 tons.

Groundnuts.

In 1938 the planted area in Java was 262,000 hectares and production was 201,800 tons of decorticated nuts, 59,222 tons of which were exported; the Outer Possessions had an import surplus of 3,304 tons, so that the net export to foreign countries for the whole of the Netherlands Indies was 55,918 tons.

Soya Beans.

In 1938 the planted area in Java was 317,397 hectares of sawah land and 62,121 hectares of ladang land; total area 379,518 hectares; production was 287,600 tons of dry beans, 11,658 tons of which were exported. The Outer Possessions had an import surplus of 3,526 tons, so that the net exports to foreign countries for the whole of the Netherlands Indies was 8,132 tons.

Sago.

In 1938, exports to foreign countries were 28,122 tons, practically exclusively from the East Coast of Sumatra and from Rhio and Dependencies.

Miscellaneous Crops.

The 1938 exports of a number of minor crops to foreign countries were:—

	tons	
Cocoa	1,600	
Cinnamon	2,505	
Vanilla	13,441	(kilograms)
Potatoes	1,487	
Chillies	3,258	
Onions	450	
Fresh vegetables	13,672	
Dried vegetables	881	
Fresh fruit	7,830	
Dried fruit	2,889	
Canned fruit	337	
Tamarind	2,880	
Ricinus seed, dry seed	6,299	
Sesamum, dry seed	3,909	
Cotton, lint cotton	424	
,, seed cotton	2,162	
Candlenuts	178	
Illipe nuts	756	
Benzoin gum	1,949	
Kratok seed	446	
Cubeba	116	
Temulawak = *Curcuma Xanthorrhiza* ...	11	
Kumis Kuching = *Orthosiphon grandiflora* ...	77	

L.A.J.R.

NOTES AND COMMENTS.

Importation of Tea Seed into Malaya.

Under the terms of the International Tea Agreement, the movement of tea seed from countries party to the Agreement is subject to severe restrictions. One of the conditions upon which Malaya entered the second Agreement, which is now in force, was that it should be possible to import tea seed into this country from countries signatory to the Agreement.

To implement this point in the Agreement, the Governments of India and the Netherlands Indies have now amended their legislation so that tea seed may be exported from those countries to Malaya and other countries in the Agreement, while it is understood that the Ceylon Government is drafting the necessary legislation for the same object. The conditions under which tea seed may be exported from India and the Netherlands Indies to Malaya are stated below.

Export of Seed from India.

A permit to export tea seed from India can be obtained from the Central Government of India on application through the Government of the Straits Settlements, of the Federated Malay States, or of the particular Unfederated Malay State, according to the Territory or State in Malaya into which the import is to be made.

The seed must be accompanied by a certificate of freedom from pests and disease which states in particular that the seed is free from "Blister Blight," *Exobasidium vexans*, and that this disease does not occur within a 50 mile radius of the area in which the seed has been collected.

An import permit into Malaya is required. This must be obtained from the Chief Field Officer of the Department of Agriculture, Kuala Lumpur, before the seed is despatched from India.

Subject to the above conditions, the export of seed from India can be obtained through this Government who will pass the request for an export permit to the Central Government of India. Full particulars should be given at the time of application—name and address of importer, quantity and description of seed and full name and address of the supplier in India. This application should be addressed by residents in the Federated Malay States and Straits Settlements to the Tea Controller, Department of Agriculture, Kuala Lumpur, for transmission through official channels, and by residents in the Unfederated Malay States to the State Agricultural Officer of the particular State.

Export of Tea Seed from the Netherlands Indies.

Netherlands Indies Ordinance No. 688 of 1939 amends the Tea Restriction Ordinance of 1938 to control the export of tea seed and planting material from the Netherlands Indies to countries signatory to the Agreement. It came into force on 23rd November, 1939. Article 10 of this new Ordinance states:—

1. It is prohibited, without the permission indicated in paragraph 2 of this Article, to export tea seeds and tea planting material.

2. The Director is authorised, after consultation with the Advisory Board, to grant a written licence for the export of tea seeds and tea planting material to British India, Ceylon, the Federated Malay States, the Unfederated Malay States, the Straits Settlements, Kenya, Uganda, Nyasaland and Tanganyika, on conditions to be stipulated by him.

The Director, to whom reference is made above, is the Director of Economic Affairs, Batavia-Centrum, Java, Netherlands Indies.

As stated in connexion with the import of seed into Malaya from India, importers of tea seed or planting material from the Netherlands Indies must obtain a certificate of freedom from pests and diseases and also an import permit into Malaya.

Replanting and Malaria.

The Malaria Advisory Board has on previous occasions invited the attention of those concerned with the management of estates to the danger of malaria resulting from the replanting of rubber. During the last few years there have been many examples of replanting causing outbreaks of malaria and the great increase in the incidence of the disease during the last two years is at least partly attributable to replanting.

In these circumstances the Board wishes urgently to renew its warnings and to urge that no programme of replanting be embarked upon until the estate's visiting medical practitioner has given it his careful consideration.

The danger of malaria, both from replanting and new planting, is due to the ideal conditions which the removal of the old trees provides for the prolific breeding of malaria-carrying mosquitoes.

Not only does breeding greatly increase in streams and drains, particularly when these become blocked by trees being felled across them, but pits left by the uprooting of trees, holes prepared for replanting, silt pits and backward sloping terraces may all become breeding places.

Much of this danger can be avoided by suitable agricultural methods, but it must be realized that increased expenditure on anti-malarial measures will often be necessary for some years after replanting.

The most suitable measures for preventing breeding can only be determined on the spot, but the following practical suggestions are made:—

Streams and drains should be put in order before felling, and the trees felled parallel to the water course or in such other way as to avoid blocking the drains with fallen timber. Pits left by the uprooting of old trees should be filled immediately if they are liable to retain water, and holes prepared for replanting should be left open no longer than is necessary to check the actual work of digging them.

In many places silt pits and terraces are liable to retain water and measures should be taken to enable this to drain off. Following replanting, water surfaces may become obscured by the growth of cover plants or by weeds in the drains and special attention must be given to such breeding places.

Active anti-malarial measures are generally confined to within half-a-mile of human habitations, but intense mosquito breeding outside this limit can still cause malaria. It is essential, therefore, wherever the replanting may be, that planting methods be designed to minimize the breeding of mosquitoes.

Quit Rents on Coconut and Oil Palm Lands.

The Government of the Federated Malay States has decided that the concession which has been in force for the past three years, whereby certain rebates of rent are allowed on land planted with coconuts or oil palms, will be extended till the end of 1940. The Government, however, reserves to itself the right to refuse any further extension of the concession beyond the end of 1940.

The concessions under reference are as follows:—

(*i*) Coconut Lands. In the case of lands exceeding 10 acres in area—

(*a*) the rent on planted areas already enjoying the rebate for land cultivated with coconuts under the Land Rules and paying $2 an acre will be reduced to $1 per acre;

(*b*) unplanted areas will also pay $1 per acre only.

In case of lands not exceeding 10 acres in area, the effect of the concession will be to reduce the rent, which is in the majority of cases less than $2 per acre, by half.

(*ii*) Oil Palm Lands. A rebate will be given of 50 per cent. of the rent payable with a minimum of $1 per acre on planted and unplanted areas.

Applications for either of these concessions should be made to the Collector of Land Revenue of the District in which the land is situated. The question of eligibility of applicants for the concession is a matter for the discretion of the State authorities.

Statistics Department.

The Office of the Deputy Registrar-General of Statistics, Kuala Lumpur, has been moved from Suleiman Building to the Headquarters of the Department of Agriculture, Swettenham Road, Kuala Lumpur.

Departmental.

Mr. D. H. Grist, Agricultural Economist, returned from leave on 30th January, 1940.

Mr. R. A. Altson, Plant Pathologist, returned from leave on 1st February, 1940.

Mr. R. G. Heath, State Agricultural Officer, Kelantan, has been granted 229 days leave with effect from the 3rd February, 1940.

Departmental.

FROM THE DISTRICTS.

Compiled in the Office of the Chief Field Officer from Monthly Reports of Agricultural Officers.

January, 1940.

The Weather.

The whole country has been experiencing exceedingly dry weather. In most districts the rainfall was a mere fraction of the average. Nowhere did the total precipitation come up to normal.

Crop Reports.

Rubber.—The price of rubber was slightly lower than during December. Supplies of acetic and formic acid are now arriving regularly and the shortage of coagulants is not so acute. The arrangements for the Departmental distribution of coagulants to small-holders has on the whole worked smoothly but it has taken up so much of the time of the Field staff that normal routine duties have had to be seriously curtailed. It is hoped that it will be possible gradually to arrange to hand over this work to reliable licenced dealers and a commencement towards effecting this has been made.

It is now well realized that, compared with estate practice, small-holders use very lavish quantities of acid for coagulation. The reason for this is that small-holders normally wish to tap their trees and machine the rubber on the same day, (on estates these operations are spread over two days) and to obtain the necessary rapid coagulation about twice the normal amount of acid is required.

One result of the coagulant shortage is that many small-holders have been forced to tap their holdings on a more conservative system, such as alternate daily instead of daily tapping.

Padi.—The general hot dry weather has enabled cultivators to harvest their crop under ideal conditions. Even in the parts of Pahang where it is usually impossible to drain off the water completely at harvest time, the land has been bone dry for reaping. Undrained land at harvest time can be very troublesome, particularly if lodging occurs, when much loss of grain and difficulty in reaping is experienced.

Last year's padi crop was a particularly good one. From crop forecasts at present to hand it appears that this season's crop is likely to be slightly less. In most States there has been some increase in the area under cultivation but this has not been sufficient to offset reduction in yield and destruction of crop that has occurred owing to unfavourable weather conditions. Very serious failures of crop have occurred in Malacca and in Selangor. In extensive areas of padi land in these two Administrations the repeated efforts of cultivators have been brought to nought

by continuous dry weather. In Malacca, it is feared that the crop may be only half that of the previous season. In Selangor there may be an even greater reduction in the coastal areas owing to water shortage. It is fortunate for the country as a whole that these districts in which failure has occurred represent only 7 per cent. of the total Malayan wet padi area.

During January some 400 Province Wellesley Malays went to Sungei Manik to settle there.

Pineapples.—The industry has been considerably disorganized by strikes. On the 8th January all Singapore pineapple factory workers came out, demanding a 20 per cent. increase in wages, and remained on strike throughout the month, as no settlement could be arrived at. In Johore four factories were operating at the beginning of the month but on the 13th and 15th two of these had to cease work as the factory hands came out on strike. Singapore pineapple growers did not suffer any very great hardship as they did not in any case have a very large quantity of fruit available. In Johore the growers suffered heavy loss as they could find no market for their fruit. The two factories which functioned throughout the month were unable to buy extensively as they also were afraid of being involved in labour troubles. The factories continued to pay the price for fruit fixed by the Central Board, but dealers took advantage of the situation and cut their buying prices by as much as 50 per cent. It is estimated that the loss to growers in Johore during the month amounted to $6,000 per day.

By the end of the month fruit supplies had dwindled, and it is unlikely that the big season crop will be available in quantity before March or April.

Pigs.—Pig prices rose to $22 to $23 per picul but they have recently fallen slightly, due mainly to the resumption of importation of pigs from Bali, which has resulted in a slackening in demand for the local product.

Fruit.—In all parts of the country the fruit season has been a good one. Large quantities of fruit, particularly durians, have been brought in for sale in the towns.

FERTILIZER PRICES, FEBRUARY, 1940.

The following are the prices current for the month of January, 1940, of some of the more important fertilizers.

Product.	Analysis				Price per ton $
	Nitrogen (N)	Phosphoric Acid (P_2O_5)		Potash (K_2O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20.6	—	—	—	114.00
Calcium Cyanamide ...	20.6	—	—	—	120.00
Muriate of Potash ...	—	—	—	50	150.00
Sulphate of Potash ...	—	—	—	48	not available
Superphosphate (concentrated) ...	—	39	—	—	120.00
Superphosphate ...	—	16-18	—	—	65.00
Basic Slag ...	—	16*	—	—	66.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	37 ¶
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total ¶ $35.00 per ton *ex* warehouse, Singapore.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham Klang and Singapore.

Statistical.

MARKET PRICES.

January, 1940.

Major Crops.

Rubber.—There was considerable fluctuation in prices during the month together with a weakening in values, there being a difference of $2\frac{3}{4}$ cents per lb. between the lowest and highest quotations. No. 1. X. Ribbed Smoked Sheet opened in Singapore at $37\frac{3}{8}$ cents per lb., and, after rising to 39 cents, fell to $36\frac{1}{4}$ cents, closing at 37 cents.

The average of daily quotations for the month was 37.84 cents per lb., as compared with 38.91 cents in December. The London average price was 11.81 pence per lb., and New York 18.95 cents gold, as compared with 11.57 pence and 19.81 cents gold respectively in December.

Prices paid for small-holders' rubber at three centres during the month are given in Table 1.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, January, 1940.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Kangsar, Perak	Kuala Pilah, Negri Sembilan			Batu Pahat, Johore.				
	10	4	11	18	3	10	17	24	31
Smoked sheet ...	46.00	46.00	48.60	45.40	—	47.12	—	43.50	43.40
Unsmoked sheet ...	—	45.00	46.00	44.00	43.85	45.70	43.76	41.85	42.31
Scrap ...		—	—	36.00	—	—	—	—	—

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8 per ton.

Transport from Batu Pahat to Singapore by lorry, excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

No purchases of rubber at Kuala Kangsar on the 3rd, 17th, 24th and 31st January, and at Kuala Pilah on the 25th January.

Palm Oil.—No particulars are yet available of controlled prices in the United Kingdom subsequent to the 31st December 1939.

Local sales of palm oil, 5 per cent. f.f.a., in sellers' drums, were made during January at the following prices: bleached oil $185 and $190 per ton f.o.b. Port Swettenham; unbleached oil $180 and $185 per ton f.o.b. Port Swettenham and Singapore; unbleached oil 8 per cent. f.f.a. $178 per ton f.o.b. Singapore.

Copra.—Sun-dried copra was quoted throughout January in Singapore at $3.80 per picul, the mixed grade remaining 35 cents per picul lower. The December average prices were $4.42 and $4.07 per picul respectively.

It is understood that a controlled price of £12 per ton for f.m.s. Straits copra is in force in the United Kingdom.

Coconut oil was sold in Singapore during January at an average price of $10 per picul f.o.b.

Copra cake was quoted throughout the month at $2 per picul, compared with an average price of $1.98 in December.

Rice.—The Singapore average wholesale prices of rice per picul in November, 1939, were as follows:—Thailand No. 2 ordinary $4.05, Rangoon No. 1 $4.35, Saigon No. 1 $3.50, as compared with $4.15, $4.35 and $3.65 in October, 1939, and with $4.40, $3.50 and $3.90 in November 1938.

The November average retail prices in cents per gantang (gallon) of No. 2 Thailand rice were:—Singapore 30, Penang 30, Malacca 30, and unchanged compared with October.

The average declared trade value of imports during November was $3.79 per picul, as compared with $3.89 in October and $3.81 in September.

Padi.—As from 1st January 1940, the Government Rice Mills, Perak, will pay $2.50 per picul for padi, plus a bonus of 10 cents per picul for pure strain S.K. 48 padi.

Retail prices of padi per 100 gantangs (gallons) were as follows:— Kedah $8; Province Wellesley and Penang $8.75; Perak $9 to $11; Selangor $11 to $15, Pahang $7 to $16; Negri Sembilan $8 to $12 ($16 to $17 Seremban and coast); Kelantan $11; Johore $12 to $16; Labuan $13; Brunei $10 to $16 (Belait $18 to $20).

Pineapples.—Prices of canned pineapples as fixed by the Central Board of Packers remained unchanged. They were as follows, per case of 48 cans of 1½ lbs. each:—G.A.Q.: Sliced Flat $4.80, Sliced Tall $4.95, Cubes $4.85; Golden: $5.40, $5.55 and $5.45.

There was also no change in fresh fruit prices which are now controlled by the Central Board.

Beverages.

Tea.—No London prices are available.

The latest Colombo prices available, quoted from *The Ceylon Tea Market Report* of 30th January, 1940, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.:—High Grown Rs. 1.02, Medium Grown 88, Low Grown 81.

Coffee.—Liberian coffee rose in Singapore from $16 to $17 per picul; Excelsa rose from $14 to $15, with a temporary fall to $13.50 in the middle of the month; Robusta opened at $8.50; fell to $7.50 and improved to close at $9.

The average of highest and lowest quotations in Singapore for Palembang coffee was $11.12 to $13 per picul, and for Sourabaya coffee $12.19 to $13.69. The December averages were $13.06 to $14.37 and $15.12 to $17.38 respectively.

Spices.

Arecanuts.—The averages of the Singapore Chamber of Commerce quotations per picul, which were stated to be approximate, were:—Best $5.81, Medium $5.50, Mixed $5.24.

The averages of the highest and lowest quotations per picul in Singapore were as follows:—Splits $5.12 to $6.62, Red Whole $5.31 to $7.41, Sliced $8.62 to $11.75, as compared with $4.87 to $7.12, $5.06 to $7.25, and $10.25 to $13.75.

Pepper.—Singapore Black weakened from $8.75 to $8.50, to average $8.62 per picul as against $8.65 in December. There were again no quotations for Singapore White which was stated to be a nominal market. Muntok White fell from $16 to $15.50, averaging $15.75 as compared with $16.40 in December.

Nutmegs.—110's fell from $38 to $34 per picul, averaging $35; 80's were quoted throughout the month at $41. The December average prices were $38 and $41.40 per picul respectively.

Penang dried nutmegs were sold at $24 per picul.

Mace.—A nominal market with no quotations. Locally produced mace, dry, was sold in Penang at $75 per picul.

Cloves.—A nominal market with no quotations. Penang cloves, dried, sold in Penang at $85 per picul 1st grade, $65 2nd grade, $48 3rd grade.

Cardamoms.—Green cardamoms were quoted in *The Ceylon Chamber of Commerce Weekly Report* of 29th January, 1940, from Rs. 1.35 to Rs. 1.50 per lb.

Miscellaneous.

Derris.—Prices fluctuated in the early part of the month due to slackening of demand, but a steadier tone was soon brought about by fresh enquiries from abroad. Average prices per picul for January were as follows:— $11 to $12 for roots sold on a basis of ether extract; $22.50 to $24.50 for roots sold on rotenone content. The December average prices were $11 to $12 and $23 to $25 per picul respectively.

Gambier.—The market for Block remained a nominal one with no quotations. Cube No. 1 was quoted throughout the month at $15 per picul as compared with an average price of $14.60 in December.

Sago.—Pearl fell from $11 to $10.25 per picul, averaging $10.69. Flour, Sarawak Fair, fell from $7.75 to $7, averaging $7.31. The December average prices were $10.95 and $7.30 respectively.

Tapioca.—Flake Fair was quoted throughout the month at $10 per picul as against an average price of $10.40 in December. Seed Pearl and Medium Pearl both remained unchanged at $11.25 per picul.

Tobacco.—Prices of prepared tobacco in Kelantan per picul were: 1st quality $100 to $170, 2nd quality $95 to $135, 3rd quality $70 to $115. In Johore dried leaf sold at $12 to $45, and prepared tobacco at $36 to $152. Prices of dried leaf elsewhere were: Province Wellesley and Penang 1st quality $34.50, 2nd quality $25.50, 3rd quality $15; Pahang $20 to $39, $10 to $33, $5 to $28; Negri Sembilan $27 to $30, $18 to $26, $12 to $22; Perak $40 to $41.50, $30 to $35, $17.50 to $30; Perak Central, cut tobacco $63, $55, $30. Malacca, dried leaf $36 to $40.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Guthrie & Co. Ltd., Kuala Lumpur, local palm oil prices by Whittall & Co., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

MALAYAN AGRICULTURAL EXPORTS, NOVEMBER, 1939.

PRODUCT	Net Exports in Tons				
	Year 1938	Jan./Nov. 1938	Jan./Nov. 1939	November 1938	November 1939
Arecanuts ...	33,769	31,399	36,439	3,131	3,317
Coconuts fresh†‡ ...	116,743†	101,818†	90,445†	13,206†	7,739†
Coconut oil‡ ...	49,140	44,032	56,264	5,241	6,157
Copra‡ ...	68,754	64,589	43,391	13,999	1,252
Copra cake ...	7,112	6,486	10,961	1,116	3,317
Gambier, all kinds ...	1,632	1,420	1,403	188	102
Palm kernels ...	9,359	8,421	9,013	1,151	675
Palm oil ...	54,377	49,866	55,118	2,848	6,039
Pineapples, canned ...	73,168	68,669	80,646	4,060	3,722
Rubber¶ ...	360,898¶	335,658¶	328,729¶	24,238¶	32,653¶
Sago,—flour ...	4,537	3,832	8,124	217	269
,, —pearl ...	4,203	3,953	3,407	385	264
,, —raw ...	5,088*	4,823*	4,245*	495*	1
Tapioca,—flake ...	981	896	939	105	83
,, —flour ...	3,072*	2,843*	1,932*	220*	63
,, —pearl ...	17,818	16,495	17,446	1,416	2,255
Derris ...	676	588	1,207	93	171
‡Copra equivalent ...	150,944	138,177	136,629	22,779	11,412

† hundreds in number. * net imports. ¶ production.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates).

Month 1939	Palm Oil			Palm Kernels		
	F.M.S.	U.M.S.	Malaya	F.M.S.	U.M.S.	Malaya
January ...	2,402.5	2,726.3	5,128.8	429.7	502.0	931.7
February ...	2,193.4	1,693.3	3,886.7	372.9	282.0	654.9
March ...	2,453.1	2,324.8	4,777.9	437.9	394.0	831.9
April ...	2,160.5	2,082.2	4.242.7	423.4	346.0	769.4
May ...	2,066.0	1,760.1	3,826.1	403.1	274.1	677.2
June ...	2,204.8	2,030.2	4,235.0	368.9	318.0	686.9
July ...	2,522.8	2,360.9	4,883.7	437.0	353.0	790.0
August ...	3,613.2	3,004.2	6,617.4	680.8	554.0	1,234.8
September ...	3,260.9	1,625.8	4,886.7	651.2	276.0	927.2
October ...	2,624.5	2,062.2	4,686.7	552.4	326.0	878.4
November ...	2,397.1	2,608.3	5,005.4	457.2	386.0	843.2
December ...	2,258.9	2,936.7	5,195.6	424.8	522.0	946.8
Total ...	30,157.7	27,215.0	57,372.7	5,639.3	4,533.1	10,172.4
Total January to December, 1938	28,979.0	22,087.7	51,066.7	5,158.9	3,620.0	8,778.9

Stocks on estates as at 31st December, 1939, were: palm oil 1,808 tons, palm kernels 1,240 tons.

STATE OR TERRITORY	Estimated Acreages of Tappable Rubber (9)+(11)	ACREAGES OF TAPPABLE RUBBER NOT TAPPED				Area of tappable rubber never been tapped (b)		Total area not tapped (3)+(5) (c)		TOTAL AREA TAPPED DURING THE MONTH		Area of tappable rubber rested under rotational systems (c)	
		On estates which have entirely ceased tapping		On estates which have partly ceased tapping (a)									
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)	Acreage	Percentage of (9) to (2)	Average	Percentage of (11) to (2)	Acreage	Percentage of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S. S.—													
Province Wellesley ...	42,922	369	0.8	9,428	22.0	514	1.2	9,797	22.8	33,125	77.2	8,286	19.3
Malacca ..	117,253	3,326	2.8	21,192	18.1	1,782	1.5	24,518	20.9	92,735	79.1	25,642	21.9
Penang ..	2,549	nil	nil	946	37.1	35	1.4	946	37.1	1,603	62.9	60	2.4
Singapore ..	31,707	4,380	13.8	6,876	21.7	211	0.7	11,256	35.5	20,451	64.5	2,935	9.3
Total S.S. ...	194,431	8,075	4.1	38,442	19.8	2,542	1.3	46,517	23.9	147,914	76.1	36,923	19.0
F. M. S.—													
Perak ...	282,812	7,674	2.7	41,794	14.8	5,910	2.1	49,468	17.5	233,344	82.5	42,363	15.0
Selangor ...	314,470	3,994	1.2	35,756	11.4	5,743	1.8	39,750	12.6	274,720	87.4	50,311	16.0
Negri Sembilan ...	261,348	7,166	2.7	48,206	18.5	10,524	4.0	55,372	21.2	205,976	78.8	37,380	14.3
Pahang ...	85,025	2,003	2.4	16,247	19.1	4,248	5.0	18,250	21.5	66,775	78.5	9,160	10.8
Total F.M.S. ...	943,655	20,837	2.2	142,003	15.1	26,425	2.8	162,840	17.3	780,815	82.7	139,214	14.8
U. M. S.—													
Johore ...	475,148	9,659	2.0	92,540	19.5	31,292	6.6	102,199	21.5	372,949	78.5	59,814	12.6
Kedah ...	196,225	8,385	4.3	18,434	9.4	5,228	2.7	26,819	13.7	169,406	86.3	35,581	18.1
Kelantan ...	31,229	403	1.3	6,626	21.2	2,160	6.9	7,029	22.5	24,200	77.5	5,453	17.5
Trengganu (d) ...	4,817	nil	nil	40	0.8	nil	nil	40	0.8	4,777	99.2	1,742	36.2
Perlis (e) ...	1,459	243	16.7	253	17.3	144	9.9	496	34.0	963	66.0	154	10.6
Brunei ...	5,970	nil	nil	1,476	24.7	260	4.4	1,476	24.7	4,494	75.3	1,170	19.6
Total U.M.S. ...	714,848	18,690	2.6	119,369	16.7	39,084	5.5	138,059	19.3	576,789	80.7	103,914	14.5
Total MALAYA ...	1,852,934	47,602	2.5	299,814	16.2	68,051	3.7	347,416	18.7	1,505,518	81.3	280,051	15.1

Notes.—(*a*) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(*b*) The acreage shown in column (7) is included in columns (3) and (5).

(*c*) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore columns (11) and (12) include columns (13) and (14) respectively.

(*d*) Registered companies only.

(*e*) Figures for the quarter ending 31st December, 1939.

MALAYAN RUBBER STATISTICS **Table I.**

ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF DECEMBER, 1939, IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 3	
								during the month		January to Dec. 1939		during the month		January to Dec. 1939						
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Dec. 1939	during the month	Jan. to Dec. 1939	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Dec. 1939
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	4,481	21,049	14,981	130,038	1,483	51,769	Nil	Nil	Nil	Nil	8,718	3,079	140,844	42,193	...	3,252	26,922	23	227
Johore ...	...	1,685	7,629	6,570	57,132	1,244	34,942	Nil	106	Nil	764	2,096	4,148	32,044	61,987	...	1,279	9,711	...	...
Kedah ...	...	224	4,815	3,963	32,529	710	9,491	Nil	Nil	Nil	Nil	1,380	1,529	18,387	22,864	...	579	6,224	...	...
Perlis ...	...	23	35	24	151	9	253	Nil	Nil	Nil	Nil	Nil	27	Nil	383	...	11	53	...	...
Kelantan ...	...	422	642	344	3,954	172	6,808	Nil	Nil	Nil	Nil	294	283	3,071	7,776	...	173	830	...	...
Trengganu ...	...	26	292	115	1,628	82	2,616	Nil	Nil	Nil	Nil	Nil	197	Nil	4,266	...	Nil	318	...	...
Brunei ...	...	9	66	58	526	90	740	...	...	...	...	...	143	...	1,286	...	Nil	80	...	...
Total Malay States	...	6,870	34,528	26,055	225,958	3,790	106,619	Nil	106	Nil	764	12,488	9,406	194,346	140,755	...	5,294	44,138	23	227
S. SETTLEMENTS :—																				
Malacca ...	...	1,320	1,779	1,441	12,322	309	6,226	Nil		Nil		1,979		26,914		...	1,304	2,389	...	...
Province Wellesley	...	443	905	613	5,004	133	1,974	Nil		Nil		4,187		72,826		...	227	1,191	...	...
Penang ...	682	2,194	11	24	208	87	855	931	10,312	26,597	141,222		Nil		Nil	1,499	1,602	14	...	...
Singapore ...	7,897	12,233	261	169	1,423	126	779	7,497		150,624		22,914		259,238		5,147	7,098	288	20	284
Labuan ...	...	16	Nil	Nil	Nil	8	116	51		630		Nil		Nil		...	23	Nil	...	...
Total Straits Settlements ...	8,579	12,206	2,956	2,247	18,957	663	9,950	8,479	10,312	177,851	141,222	29,080	Nil	358,978	Nil	6,646	10,254	3,882	20	284
Total Malaya ...	8,579	23,076	37,484	28,302	244,915	4,453	116,569	8,479	10,418	177,851	141,986	41,568	9,406	553,324	140,755	6,646	15,548	48,020	43	511

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	2,649	6,433	1,459	1,339	1,096	319
WET RUBBER	603	665	143	215	183	260
TOTAL ...	3,252	7,098	1,602	1,554	1,279	579

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to Dec. 1939
29	30	31
Singapore ...	32,689	388,446
Penang ...	5,239	110,488
Port Swettenham.	3,538	53,220
Malacca ...	102	1,170
MALAYA ...	41,568	553,324

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to Dec. 1939
32	33	34
Malay States ...	21,766	334,145
Straits Settlements	1,772	27,453
MALAYA ...	23,538	361,598

Notes :—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained
2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 31st

Locality.	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine.		
	Means of			Absolute Extremes						Total.		Most in a day.	Number of days.					Total.	Daily Mean.	Per cent.
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet			Amt.	Precipitation .01 in or more	Precipitation .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	89.4	72.5	80.9	91	70	84	74	83.2	84.1	2.78	70.6	0.67	12	10	3	3	—	121.35	5.51	46
Bukit Jeram, Selangor† ...																				
Port Swettenham, Selangor	88.0	71.6	79.8	91	68	84	74	84.3	85.1	8.52	216.4	2.02	17	12	2	—	—	174.90	5.64	47
Sitiawan, Perak ...	87.8	72.7	80.3	90	70	82	75	83.2	84.2	9.43	239.5	2.07	21	16	2	—	—	185.35	5.98	51
Ipoh Aerodrome, Perak ...	89.5	71.9	80.7	92	69	84	74	83.0	84.0	7.93	201.4	2.00	13	11	4	—	—	201.35	6.49	55
Temerloh, Pahang ...	85.3	71.6	78.5	89	68	82	74	83.4	85.3	2.45	62.2	0.51	22	17	—	2	—	133.30	4.30	36
Kuala Lipis, Pahang ...	85.4	70.9	78.1	91	68	81	73	81.8	83.6	5.70	144.8	0.78	25	18	—	22	—	121.15	3.91	33
Kuala Pahang, Pahang ...	82.8	74.6	78.7	89	73	77	77	80.7	83.7	13.74	349.0	2.67	24	17	—	—	3	98.30	3.17	27
Kallang Aerodrome, S'pore ...	84.6	74.5	79.5	89	72	75	77	80.2	82.3	14.54	369.3	7.52	16	10	—	—	1	107.40	3.46	29
Bayan Lepas Aerodrome Penang ...	87.1	74.8	80.9	89	73	82	77	82.6	83.7	6.45	163.8	2.39	9	8	1	—	—	236.20	7.62	65
Malacca Town, Malacca ...	85.7	73.8	79.7	88	71	81	76	81.4	83.3	4.32	109.7	1.58	7	6	—	—	6	171.60	5.53	46
Kluang, Johore ...	83.7	71.8	77.7	89	70	75	73	79.8	81.8	3.94	100.1	1.13	12	7	—	1	2	117.70	3.80	32
Mersing, Johore ...	81.8	74.2	78.0	89	71	75	78	79.5	81.3	20.74	526.8	5.12	22	18	—	—	7	108.10	3.49	29
Alor Star, Kedah ...	86.3	70.9	78.6	89	67	79	75	82.0	84.4	0.88	22.4	0.79	3	2	—	—	—	241.70	7.80	65
Kota Bahru, Kelantan ...	81.9	71.8	76.9	86	69	76	73	79.8	82.9	21.38	543.1	3.54	28	26	—	1	—	93.85	3.03	26
Kuala Trengganu, Trengganu	82.9	72.6	77.7	86	70	75	76	79.0	82.1	21.09	535.7	8.08	27	20	—	—	1	125.45	4.05	34
Labuan ...	83.8	75.6	79.7	88	73	77	79	81.8	84.1	20.72	526.3	2.88	24	23	—	—	1	157.15	5.07	43
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	67.4	60.2	63.8	74	57	61	63	69.3	71.0	8.59	218.2	0.94	26	25	—	24	1	65.50	2.11	18
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	69.8	58.0	63.9	74	53	66	61	69.5	70.0	3.35	85.1	1.22	15	9	—	2	1	113.40	3.66	31
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	68.5	58.0	63.3	75	54	63	60	*	*	3.11	79.0	1.23	14	8	—	—	1	103.90	3.35	28

* Not recorded.

† Station closed on 15th August, 1939.